AMERICAN
GAS LIGHT JOURNAL

VOL. CIV., No. 19. NEW YORK, MAY 8, 1916. WHOLE No. 3,035.

Decision in Complaint of Trenton, N. J.

Last year the City of Trenton filed a complaint with the New Jersey Board of Public Utility Commissioners alleging that numerous complaints have been made to the Board of Commissioners of the city respecting the poor and insufficient illuminating power of the gas furnished by the Public Service Gas Company, and praying the Board to increase the standard of gas for illuminating purposes. The city admitted that the illuminating power of the gas was at least equal to the standard fixed by Section 18, Compiled Statutes, p. 3146, but as the standard was established many years ago, to wit, during the year 1877, it was practical and entirely reasonable to require the furnishing of gas of a greater illuminating power than the existing standard.

The answer of the Public Service Gas Company to the complaint denied that it was furnishing a poor and insufficient illuminating power of gas to the citizens of the city of Trenton, or that the complainant had any cause for complaint in respect to the gas furnished; insisting that the gas furnished was equal to the standard fixed by Section 18, Compiled Statutes, p. 3146, and also equal to and in excess of a standard fixed by the Public Utility Commission; and denied that a candle power standard was either practicable or reasonable under existing conditions; that since the introduction of gas mantles the important element in connection with illuminating gas is the heating power.

The company insisted that the overwhelmingly larger proportion of gas is used in devices in which heat units play a more important part than illuminating power, and that the greatest good to the greatest number of users requires that a heat unit standard, and not a candle power standard, be fixed for gas.

And denied that there was general dissatisfaction among customers in Trenton with the gas supplied. It supported this contention by stating that with its October bills a notice had been sent to each of its 11,000 customers in Trenton, in the form of a return postal card, asking each one to send in answers to various questions regarding the service. In response to the 12,000 notices, but 220 replies were received, and analysis of these did not indicate that there was cause for complaint.

In its decision the Board says, in part:

"The laws under which the New Jersey Public Utility Commission is organized, provides as follows;

Section II, 16—The Board shall have power:

(e) After hearing, by order in writing, to fix just and reasonable standards, classifications, regulations, practices, measurements or service to be furnished, imposed, observed and followed thereafter by any public utility as herein defined.

(f) After hearing, by order in writing, to ascertain and fix adequate and serviceable standards for the measurement of quantity, quality, pressure, initial voltage or other condition pertaining to the supply of the product or service rendered by any public utility as herein defined, and to prescribe rules and regulations for examination and test of such product or service, and for the measurement thereof.

(g) After hearing, by order in writing, to establish reasonable rules, regulations, specifications and standards to secure the accuracy of all meters and appliances for measurement.

(h) To provide for the examination and test of any and all appliances used for the measuring of any product or service of a public utility as herein defined.

In accordance with these provisions after a series of hearings, at which were present representatives of gas companies, institutions of learning, other State commissions and of the National Bureau of Standards, the Board on October 17th, 1911, promulgated a set of rules and regulations designed to produce the following results:

(1) The gas as manufactured must have certain characteristics with regard to its heating value and its purity.

(2) Must be delivered under conditions as to pressures as will make possible its efficient use.

(3) Must be measured correctly, and

(4) Must be billed in accordance with correct measurements correctly taken and shown.

Rule IX. reads as follows:

"The company furnishing gas which within a one mile radius from the distribution center gives a monthly average total heating value of not less than 600 B. T. U., with a minimum which shall never fall below 550 B. T. U., may be considered as giving adequate service as far as the heating value of the gas is concerned."

Rule X. reads as follows:

"Each gas company whose output exceeds 20,000,000 cubic feet a year shall equip itself with a standard calorimeter outfit constructed and calibrated as approved by the National Bureau of Standards with which periodic tests upon the gas shall be made. A record of these tests shall be made and kept on file in the office of the company."

Rule XI.

"Gas pressure as measured at meter inlets shall never be less than $\frac{1}{2}$" nor more than 6" of water pressure: and the daily variation of pressure at the inlet of any one meter on the system shall never be greater than 100% of the minimum pressure."

Rule XII.

"Each company shall make frequent measurements of the pressure and pressure variations, and these shall be kept on file in the office of the company."

Rule XIII.

"In no case shall the gas contain more than 30 grains of total sulphur per hundred cubic feet, and not more than a trace of sulphur as sulphuretted hydrogen."

Rule XIV.

"Each company shall keep a record of complaints in regard to service, which shall include the name and address of the consumer, the date, the nature of the complaint, and the remedy."

It will be noted that these rules prescribed a standard for gas based upon its calorific or heating value, and that they are silent with reference to the illuminating or candle power standard. It was known, however, to the Board that no company in the State was furnishing gas at the time having a candle power much below 16.

With reference to the gradual changes which have taken place in the standards for "illuminating gas," the following should be noted:

(1) Up to 1906 practically all standards for gas, both in this country and abroad, prescribed an illuminating value, but contained no requirements as to heating value.

As early as 1894, however, gas engineers recognized the inadequacy of a photometric standard and the necessity for determining a calorific value.

(2) The earliest calorific standard established was 1906. Since

that time this measure of the quality of gas has been adopted quite generally abroad, and in a considerable number of instances in this country.

(3) The standards adopted for calorific value appear to have been based upon the kinds of gas being furnished in the various states and municipalities at the time the standards were adopted.

(4) Wisconsin, the pioneer in the establishment of a state standard of heating value, did, through its Railroad Commission, conduct a series of tests before the adoption of the requirement now in force, but it does not appear that these tests covered a sufficient period of time or a wide enough variety of conditions to be conclusive.

At the beginning of the year 1913, heating value requirements were in force in five states and in thirty American cities.

From the information available, it appears that the standards adopted in the various European countries were not based upon any very definite information. It is certain that all of such standards were lower than those in force in this country, and it is evident that the lower standards were based upon certain economic conditions which led the various authorities to believe that, all things considered, the customers obtained more service for the least money under the prescribed conditions.

The city submitted as an expert witness Mr. R. S. McBride, an associate chemist of the National Bureau of Standards. Mr. McBride went into the question of illuminating value and heating value of gas, and described some of the work of the National Bureau of Standards, and of the Public Utility Commission in the District of Columbia.

On cross examination, Mr. McBride stated that a fair summary of his testimony before the Maryland Commission was as follows: (Test., p. 31, Jan. 5, 1915.)

"That the real worth of gas is best measured by heat units; that 13-candle power gas with a mantle is as valuable as 20-candle power gas without a mantle; that heat units can be maintained more closely to a fixed number than candle power, thereby insuring economy of manufacture."

His discussion tended to the conclusion that the best service to the public demands a standard of thermal units with a minimum of 600, and that the use of mantles on lights, if put into general use, would cure all defects arising from lighting power even as low as 13-candle.

On further cross examination, Mr. McBride stated that the Pennsylvania Commission had consulted with him as to the heating value standard, but had not discussed at all any standard with reference to illuminating value.

When asked if he was familiar with the New Jersey standard, he stated that he was, and further stated that it compared very closely with New Hampshire, District of Columbia, Oregon and a number of other states.

In conclusion, Mr. McBride, after giving a list of cities and States which had adapted calorific standards, and other cities which had given up candle power standards, was asked the following question: "As you go around the country and come into contact with different commissions controlling this question of standard for gas service, do you find that it is the policy of the commissions or inclination of the commissions to raise the candle power standard as a general policy?"

A. "The statement of the Bureau in its third edition to the circular (referring the Bureau of Standards Bulletin No. 32) perhaps answers that better than I could do. All candle power measurements are being made more and more to test the efficiency of mantles, appliances and lighting installations rather than to test the quality of gas."

H. W. Danser, clerk in the Trenton office of the Public Service Gas Company, testified that under instruction he had sent out with each gas bill delivered on November 1st, a return postal card, upon which each customer was asked to send in any complaints regarding the service. There were about 12,000 cards sent out, one being sent to every customer who ordinarily received a bill for gas service. Three hundred and twelve replies were received, only 25/100 of 1% of the total nnmber of customers.

The replies tabulated showed:

High bills, 42; fixtures or house pipe leak, 39; fixtures or house pipe stopped up, 29; leak at the meter, 29; lights out of order, 28; range out of order, 19; poor service, 17; range leaks, 16; no cause for complaint, 12; cheap reflex lights, 11; want the salesman to call, 4; broken mantles, 2; inquired about heating stoves, 2; prepayment meter out of order, 1; wants the house pipes tested, 1; wants a fitter to call later, 1; needs a goose-neck, 1; new reflex light 1; needs a new globe for arc, 1; noisy meter, 1; wants a meter, but refuses to pay old bill, 1; water heater out of order, 1; wants balance of a reflex light delivered, 1; arc light out of order, 1; wants a meter, 1; will not answer the bell, 1; leak at water heater, 1; fixture cock too tight, 1; wanted a bill, 1; wanted a hot plate griddle, 1; wanted a pilot fixed, 1; two-burner hot plate and a kitchen light, both on ¾" pipe, wants to use both at the same time, 1; dirty inside-arc, 1; radiator attached to a Bray burner, 5; wanted a meter unlocked, 1.

Mr. Danser testified that the 17 customers classified as complaining of poor service, were so classified because when he called at the house, he was unable to find anything wrong. The classification above is practically a classification made by him after calling on each of the 312 who sent in postals.

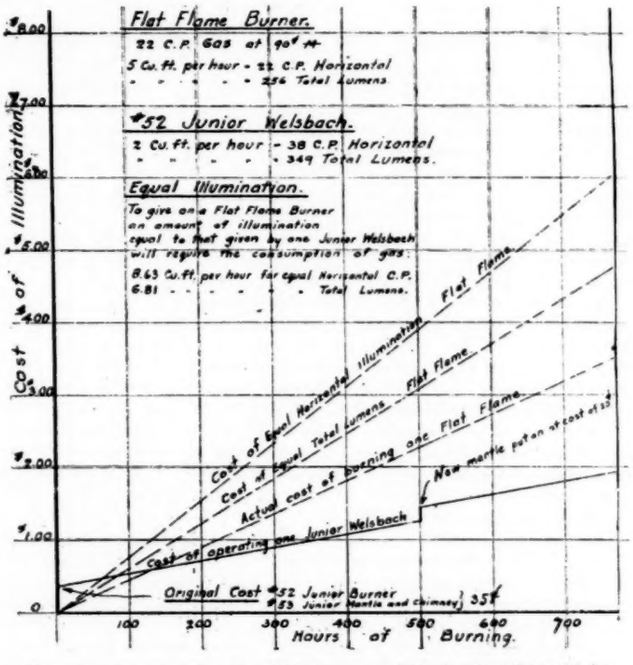

Flat Flame Burner.
22 C.P. Gas at 90¢ M.
5 Cu. ft. per hour - 22 C.P. Horizontal
256 Total Lumens
#52 Junior Welsbach.
2 Cu. ft. per hour - 38 C.P. Horizontal
349 Total Lumens.
Equal Illumination.
To give on a Flat Flame Burner an amount of illumination equal to that given by one Junior Welsbach will require the consumption of gas:
8.63 Cu. ft. per hour for equal Horizontal C.P.
6.81 Total Lumens.
Cost of Illumination
$8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0
Cost of Equal Horizontal Illumination Flat Flame
Cost of Equal Total Lumens Flat Flame
Actual cost of burning one Flat Flame
Cost of operating one Junior Welsbach
New mantle put on at cost of 35¢
Original Cost #52 Junior Burner
#53 Junior Mantle and chimney 35¢
100
200
300
400
500
600
700
Hours of Burning.

Chart I.—Comparative Cost Flat Flame and Junior Welsbach Light.

Mr. E. H. Earnshaw, Gas Engineer and Chemist, and Assistant General Manager of the Public Service Gas Company, testified concerning the cost of operation for various classes of burners, comparing the cost by flat flame burners with cost for various types of high efficiency burners. The data upon which he based his testimony is herein reproduced. The horizontal lines show the number of hours of burning; the vertical line the cost of illumination. For example, in Chart I, if we take the line marked 500 hours and carry it up until it intersects the line, "actual cost of burning one flat flame," we find the cost is about $2.25 for 500 hours; based on burning 5 cubic feet of gas per hour at 90 cents per 1,000, the rate charged in the city of Trenton. The cost of operating one Junior Welsbach burner is also shown in Chart I. In order to determine the cost of illumination, we start with the original cost of the burner (35c.) and add the cost of the gas consumed, and as the average life of mantles used with these burners is about 500 hours, we assume that a new mantle costing 20c. is put on at the end of 500 hours. Inasmuch as many burners are not carefully adjusted to the conditions found on the premises, the quantity of gas used has been assumed at 20% more than the manufacturers' rating. Chart I shows that the illumination from the Junior Welsbach burner at the end of 500 hours has cost about $1.25 as against $2.25 for that produced by the flat flame burner, and the renewal or the mantle at a cost of 20c., results in an average increase of about 4c., so the actual average cost is about $1.29 for 500 hours' illumination. These comparisons are made on the assumption that the flat flame burner consumes 5 cubic feet per hour, while as a matter of fact the majority of the ordinary flat flame burners burn more than 6 feet. The Junior Welsbach burner is rated at 2 cubic feet per hour, but as already stated, the consumption is assumed at 2.4 cubic feet.

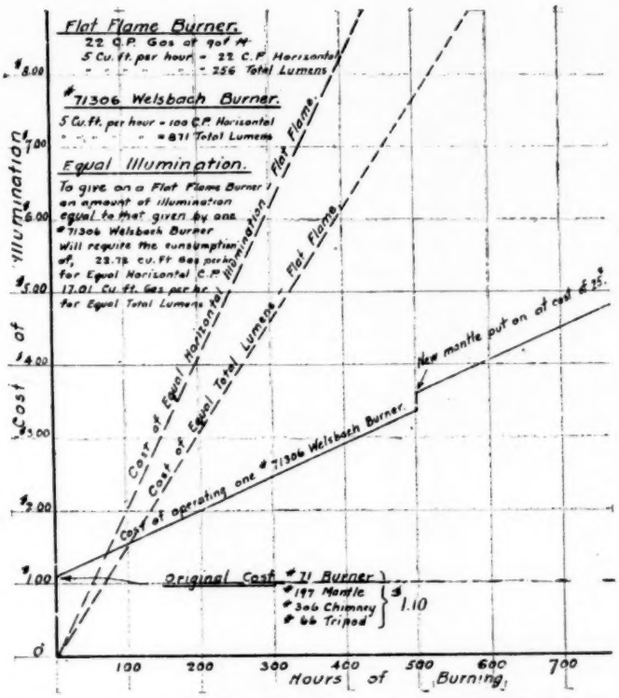

Flat Flame Burner.
22 C.P. Gas at 90 ft.
5 Cu. ft. per hour = 22 C.P. Horizontal
= 256 Total Lumens
#71306 Welsbach Burner.
5 Cu. ft. per hour = 100 C.P. Horizontal
= 871 Total Lumens
Equal Illumination.
To give on a Flat Flame Burner an amount of illumination equal to that given by one #71306 Welsbach Burner will require the consumption of 23.75 cu. ft. Gas per hr. for Equal Horizontal C.P. 12.01 Cu. ft. Gas per hr. for Equal Total Lumens
Cost of Illumination
Cost of Equal Horizontal Illumination - Flat Flame
Cost of Equal Total Lumens - Flat Flame
Cost of operating one #71306 Welsbach Burner
New mantle put on at cost of 25¢
Original Cost #71 Burner
#197 Mantle
#306 Chimney
#66 Tripod
$1.10
Hours of Burning.

Chart II.—Comparative Cost Flat Flame and upright Welsbach Lamp.

From the statements above, it will be noted that adjustment is essential to get the best service from mantle burners. The gas company makes a practice of adjusting burners upon complaint, and where good service is not being obtained by individual customers, a request should be immediately lodged with the gas company for assistance. This service is rendered without charge, but unless request is made the company has no knowledge of the customer's need for such assistance.

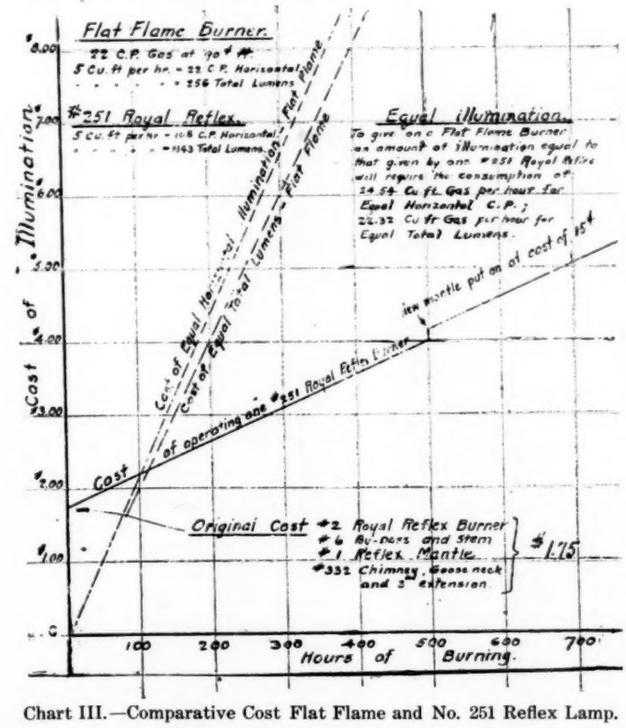

Flat Flame Burner.
22 C.P. Gas at 90 ft.
5 Cu. ft per hr. = 22 C.P. Horizontal
= 256 Total Lumens
#251 Royal Reflex.
5 Cu. ft per hr. = 10.8 C.P. Horizontal
= 1163 Total Lumens
Equal Illumination.
To give on a Flat Flame Burner an amount of illumination equal to that given by one #251 Royal Reflex will require the consumption of 14.54 Cu. ft. Gas per hour for Equal Horizontal C.P.; 22.32 Cu. ft. Gas per hour for Equal Total Lumens.
Illumination
Cost of Equal Horizontal Illumination - Flat Flame
Cost of Equal Total Lumens - Flat Flame
Cost of operating one #251 Royal Reflex Burner
New mantle put on at cost of 25¢
Original Cost #2 Royal Reflex Burner
#6 By-Pass and Stem
#1 Reflex Mantle
#332 Chimney, Goose neck and 3" extension
$1.75
Hours of Burning.

Chart III.—Comparative Cost Flat Flame and No. 251 Reflex Lamp.

Mr. J. B. Klumpp, a gas engineer, who has for some years been an officer of the American Gas Institute, testified that he had been actively engaged for a number of years in connection with the investigation of the heating and illuminating values of gas. He stated that he, representing the gas industry, generally had co-operated with the Public Service Commission of New York State in the investigation of gas manufacturing conditions, which resulted in the report already referred to. The only point of note in Mr. Klumpp's testimony that has not already been referred to, was that the committee recommended the adoption by the New York Public Service Commission of a standard calling for a monthly average heating value of 570 B. T. U. The New Jersey standard is 600 B. T. U.

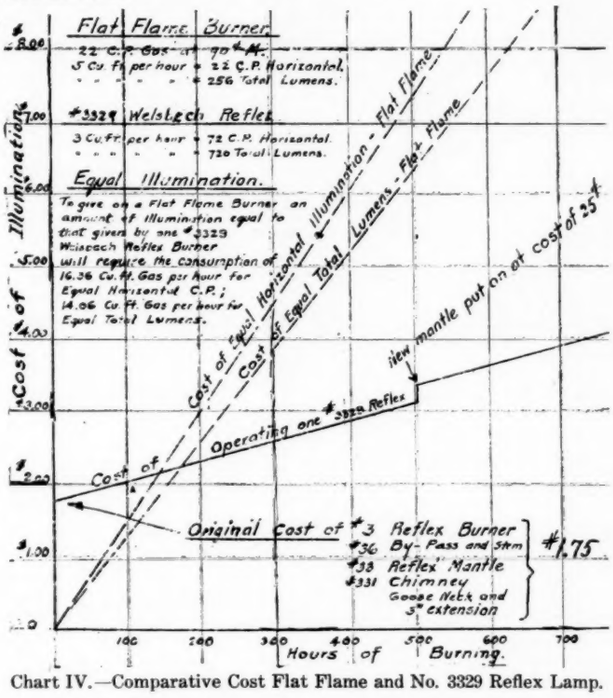

Flat Flame Burner.
22 C.P. Gas at 90 ft.
5 Cu. ft per hour = 22 C.P. Horizontal.
= 256 Total Lumens.
#3329 Welsbach Reflex
3 Cu. ft per hour = 72 C.P. Horizontal.
= 720 Total Lumens.
Equal Illumination.
To give on a Flat Flame Burner an amount of illumination equal to that given by one #3329 Welsbach Reflex Burner will require the consumption of 16.36 Cu. ft. Gas per hour for Equal Horizontal C.P.; 14.06 Cu. ft. Gas per hour for Equal Total Lumens.
Illumination
Cost of Equal Horizontal Illumination - Flat Flame
Cost of Equal Total Lumens - Flat Flame
Cost of operating one #3329 Reflex
New mantle put on at cost of 25¢
Original Cost of #3 Reflex Burner
#36 By-Pass and Stem
#33 Reflex Mantle
#331 Chimney Goose Neck and 3" extension
$1.75
Hours of Burning.

Chart IV.—Comparative Cost Flat Flame and No. 3329 Reflex Lamp.

Since the promulgation of the New Jersey rules for gas service, rules have been promulgated by commissions in other states as follows: Nevada, monthly average of 550; Washington, 600; Indiana, 600; New Hampshire, 600; Pennsylvania, 570; Montana, 475 (this difference partly due to elevation above sea level for which a correction has to be made); Oregon, 600; District of Columbia, 600; Illinois, 565.

Conclusion.

The complaints concerning poor service in Trenton naturally have some foundation. Trenton is not a new city; some portions of it are as old as any in the State. Many of its houses were piped for gas long before gas was used as extensively as it is to-day, and when the importance of ample-sized piping was not realized. Furthermore, gas piping becomes clogged with materials which interfere with the passage of the gas.

The growth in the use of the gas for heating has been so great in the past twenty years as to change the conditions under which gas is used. As a result, we find to-day that the gas used because of its heating value, ranges somewhere between 80 and 90%. To impose upon the users of 80% of gas an increased burden due to an increased cost of manufacture, amounting to from 8 to 15 cents per 1,000 cubic feet, would be unjust and unreasonable; especially when there are satisfactory substitutes for the flat flame burner, which result in very large savings to those who use gas for illumination.

This is borne out by a statement in a report by Morris Llewellyn Cooke, Director of Public Works of the city of Philadelphia, on the cost of producing illuminating gas in American cities. He states as follows: "Since, undoubtedly, in excess of 75% of all the gas now used is for purposes where a calorific value is the only essential, comparisons are justified, though a survival of the candle power standard in some places has an influence in causing the retention of somewhat more costly methods of manufacture than are really desirable."

It is the practice of gas companies, and the Public Service Gas Company is no exception, to keep permanently employed a number of fitters to make, without charge, adjustments, in order that the customers may obtain the best service from the burners and appliances they have in use. The Board believes that the company ought to systematically call attention of the customers who use

gas for illumination to the modern appliances for illumination by gas, give information as to where these articles may be obtained and calling attention also to the company's practice with regard to care and inspection of customer's equipment.

The company's system of keeping record of complaints does not appear to be lacking, and testimony shows that complaints have been followed up with a reasonable degree of promptness. The attention of the public is called to the fact that one of the Board's rules requires that the gas companies keep records of all complaints, showing the nature of the complaint, time it was received, the time remedied, and the nature of the remedy. Because of a large number of older houses in Trenton, it is quite certain that many of the complaints of poor service arise from insufficient or clogged piping; and where customers are suffering from poor service, the attention of the company should be requested to inspect the premises to determine whether the remedy lies in the renewal of a service pipe or in the renewal or overhauling of the house pipes.

The company's duty, as the Board sees it, extends—

1st. To the production of a product having a certain purity and certain value with regard to its heat units and illuminating value; which illuminating value, under present methods of manufacture cannot fall much below 16-candle power.

2d. Gas must be delivered as far as the outlet side of the meter under such conditions with regard to pressure as to enable the efficient and satisfactory use of the gas.

3d. Gas must be measured correctly.

4th. The measurements as indicated on correct meters must be clearly set out on the bills sent to the customers.

If a gas company fulfills these requirements, and deals with its customers in accordance with reasonable rules and regulations, adequate and proper service will be provided. These general rules of practice, however, ought, in the Board's opinion, to include a sufficient amount of educational advertising as will enable customers to make the most efficient and economical use of the product the gas company sells.

With the above recommendations which affect both the customers and the company, the complaint will be dismissed."

Classification and Analysis of Gas Accounts.

By V. V. Smith.

The Classification of Gas Accounts is a question that each gas company solves to fit local conditions and requirements for convenience of both consumer and company. A large company may find it desirable to separate into classes industrial, semi-industrial, municipal and other special commercial accounts that show large consumption; each division separately ledgered. Other companies, large or small, may find such an arrangement unwieldy, and prefer alphabetical or sectional street divisions for all general accounts, and the maintenance of separate ledgers for consumers of large quantities of gas. An additional separation may be made of these accounts, part read monthly, the balance at weekly or semi-monthly intervals. In the classification of the account each company works out its own problem with due regard for rules laid down for their guidance by the State through its accredited representatives.

It is in the analysis of the accounts, and our failure to secure proper remuneration from consumers who consciously or unconsciously secure service for which they do not pay, that we should show more interest. Is it not possible that in our desire for more business and heavier output, we lose sight of the fact that a large proportion of our consumers are carried at a loss? What effort are we making, individually and collectively, to gather the facts in our business, properly prepare them and then present them to the Public Service Commission for study and adjustment?

It should be the desire of all practical gas men to expand the business and encourage the use of gas in fields untouched, but in doing so the problem of lower priced gas confronts the average gas company; the problem of a price to the industrial consumer that will place us in a fairly strong competitive condition. We realize from our net results that lower priced gas to the individual user is out of the question, unless provision be made for a service charge to those consumers whose gas usage expressed in dollars and cents is unequal to what may be termed Holder and Commercial Costs. With such charges thrown where they belong, the possibility opens for enlargement of the business by sales for industrial use; such sales bring bona fide increase in business, additional consumption, additional output.

(1) In analysing the accounts, an arbitrary figure for the cost of gas may be taken, termed Manufacturing or Holder Cost.

(2) Commercial Costs will include distribution charges, commercial charges, a fair proportion of overhead, taxes, insurance, legal expense, reserve for uncollectable accounts, etc. (No provision made for depreciation, bond interest or stock dividends, which should be taken into consideration in arriving at an absolute basis of determination of the cost of furnishing meter service to each individual consumer.) Divide this total by the number of consumers served, and we have a fairly accurate general individual Commercial Cost.

The chart worked up by J. H. Maxon, general manager of the Central Indiana Gas Company of Muncie, included in his paper last year, illustrates the condition in the average company, and is used herewith. A Holder Cost of 35 cents is assumed in the calculations and a Consumer's or Commercial Cost of 75 cents per month.

	Class	Number of Consumers.	Gas Used.	Average per Consumer.
1	0— 500 feet	900	375,000	417
2	500— 1,000 "	1,000	875,000	875
3	1,000— 2,000 "	1,500	2,875,000	1,916
4	2,000— 3,000 "	750	2,125,000	2,833
5	3,000— 5,000 "	500	2,000,000	4,000
6	5,000—10,000 "	200	1,500,000	7,500
7	10,000—20,000 "	100	1,260,000	12,500
8	over 20,000 "	50	1,500,000	30,000
		5,000	12,500,000	

Class	Cost of gas.	Costs other than gas.	Total Cost.	Revenue.	Net Earnings.
1	$131.25	$675.00	$806.25	$450.00	—$356.25
2	306.25	750.00	1,056.25	875.00	— 181.25
3	1,006.25	1,125.00	2,131.25	2,875.00	743.75
4	743.75	562.50	1,306.25	2,125.00	818.75
5	700.00	375.00	1,075.00	2,000.00	925.00
6	525 00	150.00	675.00	1,500.00	825.00
7	437.50	75.00	512.50	1,250.00	737.50
8	525.00	37.50	562.50	1,500.00	937.50
	$4,375.00	$3,750.00	$8,125.00	$12,575.00	$4,450.00

The above chart was prepared on the basis of an equalized commercial cost to all consumers, but in practice are we justified in assuming that the figures are correct? Will not an analysis of the cost of setting and removing meters, meter shop tests and repairs, collecting, meter reading and complaints disclose a condition that upsets the equalization theory and awaken us to the fact that a different cost unit must be taken in the various classes of users?

In the case of the local company, a record has been made giving a comparative showing of usage by consumers, and in addition, a record made of the average length of time meter stayed in service in each class. The record is as follows:

Consumption.

Class.	Average Monthly Usage.	No. of Consumers.
1	0— 200 feet	1,990
2	200— 500 "	2,428
3	500— 1,000 "	4,999
4	1,000— 2,000 "	14,978
5	2,000— 3,000 "	12,990
6	3,000— 5,000 "	12,223
7	5,000— 10,000 "	4,538
8	10,000— 50,000 "	948
9	50,000—500,000 "	142
		55,246

(For two years, every effort has been made to remove all meters where no consumption or extremely limited consumption is shown, if the consent of consumer can be secured without friction.)

Setting and Removing Meter Record.

Class.			No Months in Service.
1	0—	200 feet	7
2	200—	500 "	8
3	500—	1,000 "	10
4	1,000—	2,000 "	15
5	2,000—	3,000 "	16
6	3,000—	5,000 "	16
7	5,000—	10,000 "	19
8	10,000—	50,000 "	20
9	over	50,000 "	12

A study of this record shows that an equalization ratio is not maintained; and in addition to the heavier costs for setting and removing meters and meter shop expense on Classes 1, 2 and 3, a reasonable conclusion is that the collection and complaint expense has increased in similar ratio.

The general theory has been that the cost of reading meters, making bills, keeping records, collecting, complaints, taking contracts, cashier's work, and all phases of the distribution system dealing with meters and maintenance of service is of an integral nature, not varying with gas bill or size of meter installed; and that this expense should be borne equally by all consumers, regardless of consumption. But it is my belief that such a conclusion is unfair to the gas company, and to those consumers who in their usuage equalize the loss on customers who do not bear their fair proportion of the outly made to give them service.

The equalization theory demonstrates that certain classes of consumers are carried at a heavy loss; and separate analysis of classes magnifies that loss materially. An analysis of the accounts shows the user of prepayment meters in each class is a heavier burden than the user of a regular meter, complaints are as frequent, and the reading of meters per man is in a ratio of 65 to 100, with a meter testing cost increased 50%.

In addition to the holder and regular commercial costs each consumer should be charged with his proportion of the interest on the general system, and of costs and expense applicable to the system, including a reserve for depreciation. For illustration the local company had an investment in excess of $5,000,000 in its distribution system, meters, shop equipment, stores, etc. Six per cent. interest on this totals $300,000.00

Add to the interest charge
Actual costs in 1916 as follows:

Distribution operation	78,921.87
Distribution maintenance	48,643.97
Commercial expense	58,793.66
Total	$486,359.50

Without allowing for any overhead, this means an average service cost on 55,246 meters of over $8.75 per meter. The local gas rate is 55 cents per 1,000; a service charge of this amount per month, would be only $6.60, less than the fixed average cost per consumer; the company carrying an excess cost of $2.15 per year on each and every consumer using or paying for less than 1,000 cubic feet of gas monthly. In addition to the above, the holder cost of 35 cents per 1,000 must be added for the actual consumption per meter.

The item of waste in furnishing meters to consumers who use them only in emergency, is an abuse that has magnified as the gas industry has developed. It accounts for many consumers in classes 1, 2 and 3, and should be reached through a flat service charge, not made unreasonable, but sufficiently large to deter gas leeches from applying for service when service is not desired, but rather accommodation when other lighting, heating or cooking devices fail them. This non-consumer would hesitate about throwing a consumer's cost on the serving company, if he realized that he would be compelled, in some measure, to stand part of the outlay and expense.

How often we hear the following when our complaint man investigates as to non-usage, and when he has ascertained the facts, courteously asks to be allowed to remove meter:

1. "Use for melting crating wax occasionally."
2. "Use for cigar lighting."
3. "May use gas next summer."
4. "Use to demonstrate occasionally."
5. "Use for heater when not cold enough for coal stove."
6. "Use for light in banana cellar."
7. "Use on small burner for soldering."
8. "Use small burner in dental work."
9. "Use in case of emergency, when electricity fails."
10. "Use for sterilizing instruments."
11. "Use small burner in heating glue pot."
12. "Use in soldering jewelry."

With authority to charge a flat rate for "service ready" each month, either of two result will ensue:

1. Additional revenue to partially cover service furnished.
2. The meter released—going into Meter Stock, and ready for a bona fide user when he applies for service.

The charge for readiness to serve should be high enough to cover the actual cost of rendering service, which in no case should be less than the established rate for 1,000 feet of gas per month. It would seem that a charge equal to 1,000 cubic feet of gas would be the least charge that should be considered, and no fair minded consumer who uses gas merely as an accommodation or reserve should object to such a charge.

It is true that not all the non-profitable gas accounts are due to accommodation meters furnished; there are consumers who in good faith contract for gas, but whose bills are so small, figured either by the month or annually, as to cover only a small per cent of the fixed expense in furnishing service. In this case the element of good faith wins our personal regard, but does not blind us to the fact that the consumer is not bearing his proportion of the expense of giving service; and forces the conclusion that it is not unreasonable to ask that he as well as "Mr. Accommodation Asker" should contribute in some degree to the cost of handling his business and furnishing him service. At the present time, taking all gas companies into consideration, probably one-third of the consumers are carried at the expense of the other two-thirds, which is the worst kind of discrimination, and this while the Public Service Commission acts of all States provide that there must be no discrimination. The electric light companies have always recognized this discrimination, and have made service charges. The Public Service Commission are accustomed to dealing with electric rates and undoubtedly recognize the the weakness of our system of charge and should, therefore, be easily convinced of the propriety of a service charge based on reasonable cost for service. In view of this condition in our business—in view of the discrimination which we must admit when we make any attempt at analysis of our accounts, is it not the duty of the Indiana Gas Association through an authorized committee, to present the matter to our worthy Commission and ask for a ruling which will permit a fair basis of charge to those whose usage is unequal to the cost of serving them?—*Paper read before the Indiana Gas Asssociation.*

Gas From Wood.

Wood is in more or less constant use in many of the smaller Australian gas works, mixed with coal to the extent of about 25%. Only certain classes of timber are suitable, the best being the box and red-gum varieties. It is claimed that the resulting gas has many advantages over ordinary coal gas, chiefly owing to the fact that napthalene troubles are almost eliminated, while there is some considerable reduction in the amount of carbon deposited on the retorts. The average yield of gas amounts to about 12,000 cubic feet per ton of wood carbonized; but the great drawback is the charcoal in the coke. It is usual to separate the charcoal from the coke and use it for heating the furnaces. For power purposes, wood gas is manufactured from waste material such as sawdust and shavings, or even leaves, and, except for detarring and washing, is consumed crude, unmixed with other gas. Suction plants designed for wood waste will work with material of any description between dust and lumps six inches in diameter. In general, it is necessary to install a condenser, washer and tar extractor, so that the supply pipes to the engine may be kept clean. The moisture of the wood is important, and if the water content is greater than 60% preliminary drying should be resorted to. Wood gas made by distillation in gas works has a calorific value of about 400 B. T. U., whereas that generated by the suction producer plant is only about 160 B. T. U.

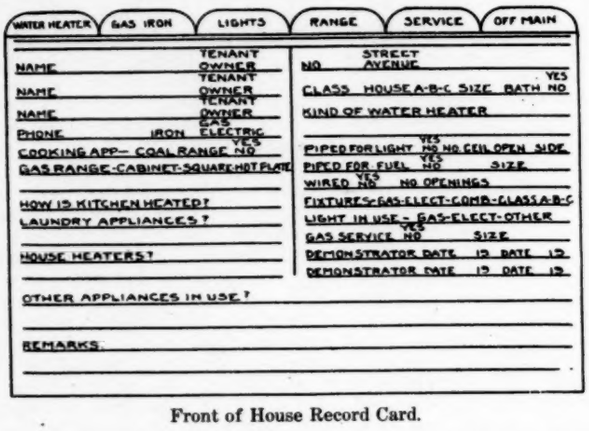
Flue Gas Analysis.—If as many people tested their flue gases as there are books and pamphlets on the subject, we would be much more efficient as a nation and perhaps more pedantic. Bulletin 97 of the Bureau of Mines on "Sampling and Analyzing Flue Gases," by H. Kreisinger and F. K. Ovitz, gives methods of testing results and the value of analysis in reducing boiler room losses.

Solicitors and House Record Cards---Methods of Checking.

Paper by E. D. V. DICKEY, to the Illinois Gas Association.

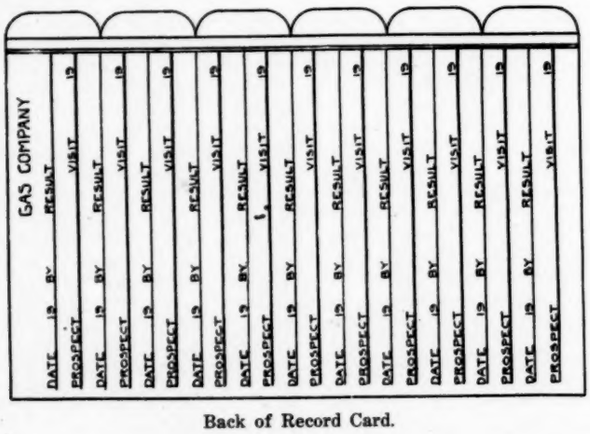
The necessity of keeping a fairly accurate check on solicitors, especially when they are on straight salary basis, is evident, and it is also obvious that some uniform method of filing prospects for appliance sales is necessary. A certain proportion of prospects will unquestionably be overlooked, and valuable information concerning them lost unless some uniform system of caring for them is in force. Important data will be lost when solicitors are transferred or leave the employ of the company, unless their knowledge of prospects is recorded. The object of this paper is to explain methods of filing and classifying information concerning prospective customers, and of checking the solictor's daily work.

The general record card, made out for each house, on which is shown all appliances installed, is probably used by all companies in one form or another, but it is handled in different ways. Primarily this card is a record of the appliances that are installed or in use at any given address, and, what is of more importance, it shows the appliances that are not yet supplied to that particular house.



Front of House Record Card.

The accompanying cuts show the front and back of a record card. Some companies keep these cards up to date by entering the sales from the completed work orders each day, which, of course, takes time and expense. If a territory is canvassed periodically it would seem sufficient to bring the cards up to date at these times. Some companies aim to solicit all houses every 4 months, some twice a year, some once a year; and still others very seldom make a general canvass of their town. The frequency of canvassing is governed, to a great extent, by local conditions and the amount of money it is desired to spend. It would seem advantageous in any community, especially where the gas company is competing with an electric company, to make a general canvass at least once a year.



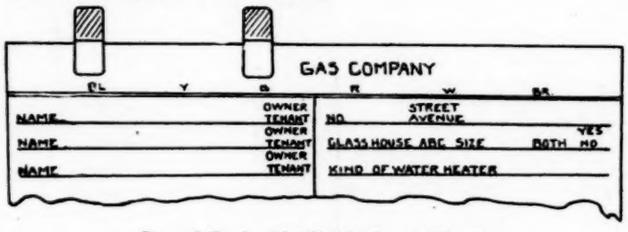
Back of Record Card.

The Record Card can be used in the field by the solicitor, or he may be supplied with a separate Call Card, in which case the information on his card will have to be transferred to the Record Card at the office, or the information taken from the completed work orders. In a house-to-house canvass, the solicitors should make a full inspection of the appliances and tabulate them on this Call Card, which is checked against the office record. Under this two card system we have the advantage of always keeping the Record Card in the office and in good condition, but it entails extra expense.

The alternative is to use the Record Card as the working card as well as the office record. By so doing the solicitor completes his card report on the job, eliminating all office work on the records by either solicitor or office force. The card record is then necessarily up to date at all times, in fact works automatically without any extra expense. The disadvantage of this scheme is that the cards are liable to be lost, and on canvass work the solicitor—having a full record of the residences he is visiting—cannot be checked as efficiently; however, this system works out particularly well in medium size companies where there are only a limited number of solicitors reporting to the manager or the head of the department. The remaining part of this paper refers to the use of the one card system.

Referring to the Record Card illustrated, we note that the front of the card shows most of the information necessary for the New Business Department. The projections on the top of the card are cut off as orders for the different items are procured, so that the remaining ones show the principal items to be solicited in the future. A list can easily be made, or count taken, of houses not provided with stoves, irons, services, or any of the items designated by the remaining markers. It is particularly valuable to have the houses not provided with services and stoves stand out in the House Record File, so that they can be counted from time to time, and results noted. This class of house is probably solicited more often than others, and under this system these cards can readily be removed from the file for soliciting. These markers also give a ready mailing list for literature it is advisable to send to customers not as yet provided with service or some particular appliance. Similar cards are in use by another company, who reports satisfactory results.

Companies using a Record Card not provided with these projections can show the items missing by attaching colored enameled steel signals such as shown here.



Record Card with Slip Marker or Signal.

A convenient color scheme for those signals is as follows:

Brown	No service
White	Dead service
Red	No range
Green	No lights
Yellow	No gas iron
Blue	No water heater

When turning-in cards for the completed file, solicitors attach the proper markers to the top of the cards. If the cards have a call-back date the signals are not attached. If a given territory is quite destitute of water heaters, or of gas irons, it would require a large number of signals to supply all of the cards; therefore, it might be well to leave off the signals for such items until the territory is better worked.

It is advantageous to use such signals in connection with the House Record Card illustrated, to designate "no meter" or any other desired information not covered by the markers.

It has been found advisable in our situation to use the card shown, for both the office record and solicitor's Call Card. All

writing on this card is completed on consumer's premises, so when solicitors report in the morning they have only to arrange their cards and turn them in. The back of the card shows the results of the present call and future prospect, with date on which to visit. If a number of calls are made at a house without results the "visit" date can be changed, thereby saving space. Should there be no live prospect for future sales, the "Prospect" line is checked and the card is filed in the completed file. A solicitor's previous day's work can be checked in a few moments, and each card, as it is reported upon, examined by the manager. The completed cards, showing the results accomplished, are turned in first and put aside for the completed file. The cards with future prospect dates on them are next turned in and filed in the prospect or "live" file. If a man is handling a limited number of solicitors he can have the prospect file before him in checking-in his men, and can readily put the cards dated ahead under the proper date in this file.

The solicitor's cards are kept under the following headings:

1. Cards turned in by solicitors not having any immediate prospect or call back date specified are filed according to streets, in the completed file.

2. Cards that designate a future calling date are filed in the "Prospect" drawer, which is, of course, the active file. There are index cards in this file for each day of the current and succeeding month, while the remaining ten months of the year are designated by monthly cards. In this way we have all the active prospects for the ensuing year in one file. We do not find it necessary to have a daily separation of our prospects for any more than a two months' period. Each morning the cards for the prospects to be called upon that day are taken from the file and distributed to the solicitors. In a large situation it would probably be necesssary to have small groups of solicitors using one of these prospect files, or if advisable, each solicitor could have a drawer in which to keep his prospects. The writer has found it advantageous to prohibit solicitors from keeping personal notes on prospects, and training them to put their cards, with all information, in the prospect file, even though the calling date is only two days away. This keeps their pockets and desks free of notes and cards belonging to the file. Copies of special letters written are attached to the proper cards, together with any prices quoted on piping, etc.

3. Separate files are kept for factories, outlying stores, the business section, and new houses. We find it advantageous to have these separated from the regular residence file, as they are solicited more often.

In any situation, the solicitors may either do their own filing of completed and prospect cards, or may turn them over to the manager for filing. This all depends on how closely the mannger, or head solicitor, wishes to check the day's work of his men. He can examine the cards that the solicitor turns in and get a full report on each call, if desired.

When a general house to house canvas is to be made, the solicitor is given the Record Cards for the street to be canvased. He verifies the installations, and fills out new cards in cases where the old card is missing.

New houses should, of course, be followed up very closely, and it is advantageous to have record cards of a distinct color for houses erected during the current year. These cards should be started as soon as the building permit is issued. At the close of the year statistics on piping, fixtures and other appliances can be compiled, after which the record can be transferred to cards of the regulation color. It is also advisable to keep a list of all new houses in a small book, which can be checked against the "New House Cards" every month to see that none are missing.

Prospects for new business are turned in by house maintenance men, fitters, and in fact, by all employees. Some companies furnish a form for this purpose, which is carried by the workmen. When such prospects are received the head solicitor takes the record card from the file and enters the prospect, putting the card in the active file under the proper date.

This paper does not pretend to cover methods of tabulating the results obtained by solicitors; such as their daily reports of work done, blackboard checking, daily reports of sales by districts, and the more elaborate systems of some companies. It is merely intended to point out a few items in connection with keeping track of prospects, and the use to which the record card can be put.

The Small Consumer.

Most successful business is built on the principle that a large number of small sales are to be preferred to a small number of large sales. The logic of this is clear—namely, the loss of several small consumers would not materially affect the profits of the company, whereas the loss of one or two large consumers would.

For the gas company to determine what constitutes a small consumer, and under what conditions he becomes profitable, it is necessary that account be taken of two sets of conditions—general and local.

The chief general conditions are:

(a) The amount of capital invested in the property per consumer.
(b) The cost of operation.
(c) The readiness to serve expense.

The local conditions are:

(a) The location of the company.
(b) The class of people served.
(c) The earning capacity of the consumer.

As the number of customers increases the capital invested per consumer is proportionately decreased. As a result the interest on the fixed charges which each consumer must bear is diminished. Therefore, from this standpoint the "taking on" of a large number of consmers would appear advisable.

The larger the company the smaller are its operating expenses per consumer. This circumstance permits a large company to carry profitably a certain percentage of small consumers, whereas a small company, because of large operating expenses per consumer, cannot carry at a profit a similar percentage of small consumers.

It costs the company just as much to bring the gas to the burner of the small consumer as to the large consumer; therefore, there should be a fixed charge to cover this service.

Every company before taking on small consumers should ascertain what its "ready to serve expenses" are. When this has been determined the company is able to define what the "small consumer" is—namely, a consumer who uses sufficient gas to cover the expense of doing business.

Recapitulating, the small consumer (his rating having been determined through the medium of the ready to serve expense) is desirable, even if not wholly profitable, because every additional customer means a decrease in the amount of capital invested per consumer, and a lowering of the cost of operating expenses per consumer, with the result that certain "medium consumers" who would otherwise be unprofitable are made profitable by the addition of a number of small consumers, who serve as props and help take the overhead load.

The gas consumption of the community is dependant upon the size of population, climatic conditions and the number and extent of the city's industries. A large number of inhabitants means more customers, and the percentage of small consumers is influenced by the character of the labor employed in the industries. If the climatic conditions favor gas for all the year, the small monthly consumer should be encouraged, for his yearly consumption will total more than that of a profitable monthly consumer in a less equitable climate.

The consumption is influenced by the nationalities and the character of the people.

The small consumers are generally foreign or colored. The colored element, will never migrate from the small consumer's class, but the foreign element offers a good field, because they can, by proper handling, be made the large consumer of to-morrow. By proper handling I mean suitable education, such as house to house demonstration and domectic science courses. As a rule the families of the foreign consumers are larger than the native, and the quantity of food consumed is apportionately larger. It is, therefore, well to encourage this class and gradually develop them into large consumers.

I do not consider, however, that giving away stoves and lights tends to make a small consumer increase his gas consumption.

People can only buy gas, or for that matter any other commodity, in proportion to the wages they receive. Their standard of living is regulated by their earning capacity. The earning capacity being known, the amount of money he can spend for gas is readily ascertained. The company knowing what the minimum consumption must be to cover its "ready to serve expense" is in position to judge what constitutes a small consumer, and what percentage of its total customers it can profitably carry along as small consumers.

—From paper by S. E. Vecker to Southern Gas Association.

AMERICAN
GAS LIGHT JOURNAL

SANFORD K. CAMPBELL, Editor.

Published Weekly by
AMERICAN GAS LIGHT JOURNAL, INC.
42 Pine Street, New York, N. Y.

ELBERT P. CALLENDER, Pres. and Treas.
FREDERICK A. SOUTHWORTH, Vice-Pres.
CHARLES H. WADELTON, Secretary and Manager.

Subscription, $3.00 per year, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philliphines.
In Canada, $4.00. Foreign, $5.00.

Entered at the Post Office, New York City, as Second-Class Matter.

CONTENTS.

DECISION IN COMPLAINT OF TRENTON, N. J. 289
CLASSIFICATION AND ANALYSIS OF GAS ACCOUNTS, by V. V. Smith. 292
GAS FROM WOOD 293
SOLICITORS AND HOUSE RECORD CARDS—METHODS OF CHECKING, by E. D. V. Dickey 294
THE SMALL CONSUMER 295

EDITORIALS 296
Educational Advertising a Requisite—Government Aid in Vocational Education—Newark's Celebration.

SPECIAL ENGLISH CORRESPONDENCE 297
GRATUITOUS WORK, by B. F. Noble 298
HYDROGEN FOR BALLOONS 299
Recent Patent Issues 301

NEW METHODS AND APPLIANCES 301
Regulation of Street Excavations in Houston, Tex.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 302
A Boston Entertainment—Burned the Manager—Waterville, Me., Contracts—Empire State Gas Production Meeting—Institute Committee on Meters—Mr. A. C. Brown General Manager—Southern Association Bulletin—Peoples Gas Campaign—Outside Savannah—For Lakeland Office—Philadelphia Gas Sales—Lynn Association—Gas from Garbage—Davenport Improvements—Pittsfield Banquet—Pacific Gas and Electric Pensions—Natural Consolidation and Artificial Help.

UTILITIES COMMISSION NEWS 303
New York Water Power Development—Mr. Aitchison Leaves Oregon Commission—Connecticut Commission Orders Main Extension.

Financial Notes 304
Meeting Times of the Various Gas Associations (Advertising Section) 22
Public Lighting Table for May, 1916 (Ad. Section) 24

Educational Advertising a Requisite.

Theodore Roosevelt, in one of his characteristic speeches, once said that it was not sufficient that a man be honest, but that his honesty must be militant. Passivity in business management has been forcibly ruled against by courts and commissions, the latest being the New Jersey Board of Public Utility Commissioners in the Trenton, N. J., case, which will be found in other columns. The Commission's Rules of Service are standards that may not be broken without penalty, but the unwritten standards of militant, aggressive, broadminded business activity are those that decide questions at issue. The order in the Trenton case squarely states that because the company aggressively endeavored to place the latest devices in the hands of the public, no action was needed to protect that portion of the public who continued to use old-fashioned and inefficient appliances.

In summing up, the Board states the company's duty to be as follows: To provide gas of certain purity and heating value, under which conditions the illuminating value will not fall much below 16-candle power. That it must be delivered at a proper pressure, measured correctly and billed in accordance with the readings.

Further, it says: "If a gas company fulfill these requirements, and deals with its customers in accordance with reasonable rules and regulations, adequate and proper service will be provided. These general rules of practice, however, ought, in the Board's opinion, to include a sufficient quantity of *educational advertising* as will enable customers to make the most efficient and economical use of the product the gas company sells."

Educational advertising is given as the way for carrying out the Board's idea of militant efficiency. Its scope is not prescribed, its details are not dwelt on and its methods of application are not mentioned; but its necessity is recognized. Engineering must be backed with educational publicity, if adequate service is to be provided. Gas men who are not taking care to see that their advertising work co-ordinates with that of the engineer, should get their fences repaired.

Government Aid in Vocational Education.

If the Federal Government contributes to the support of institutions giving instruction on matters referring to agriculture, why should it not extend similar help for training in trade and industry at large?

A Committee of the Chamber of Commerce of the United States investigating this matter reports that but one per cent. of the population who need vocational training are reached by present systems, and suggests that Federal aid be invoked. They recommend:

"Liberal Federal appropriations for promotion of vocational education in the United States:

"That Federal appropriations be allotted among the States, bearing uniform relation to appropriations made by the States for like purposes.

"The creation of a Federal board, representative of the interests vitally concerned, to be compensated sufficiently to command ability.

"That the Federal board should appoint advisory committees representing industry, commerce, labor, agriculture, homemaking and general or vocational education."

This training is, of course, but a foundation for specializing, and it would result in a general advance in intelligence of recruits for industry.

Newark's Celebration.

The City of Newark, N. J., has begun a six month's celebration of its Two Hundred and Fiftieth Anniversary, and an appropriate opening of the ceremonies was the dedication of the Public Service Terminal on April 28th. On that evening Mr. Thomas N. McCarter, president of the Public Service Corporation of New Jersey, delivered an address in the Park Place Theatre to a joint meeting of the corporation's Gas, Electric and Railway Companies' employees, giving an account of the origin and progress of New Jersey utilities, and of those of Newark in particular.

SPECIAL ENGLISH CORRESPONDENCE.

Monthly Letter From Norton H. Humphrys, Salisbury, England.

ACTION OF SALTY COALS ON REFRACTORY MATERIALS.—THE LONDON COKE COMMITTEE EXPERT AND COKE FOR STEAM BOILERS.—TAR DISTILLATION AND REDEEMABLE CAPITAL.

That the incombustible matter in fuels exercises some sort of a chemical action on fireclay, apart from the effects of high temperature, and that such action is more noticable with some kind of fuel than with others, is known to all experienced gas engineers; the phenomena belongs to that numerous class of happenings that they cannot find time to investigate, being fully occupied with affairs of more immediate importance. Which suggest that if gas apparatus manufacturers find it to their advantage to run a research department with a university man at the head, any gas undertaking making 200 millions cubic feet of gas per annum or upwards, might do worse than follow the lead. Unfortunately the majority of gas directors or committee men are not sufficiently educated in this respect. Where the concern enjoys the advantage of one more competent technical men on the board, a properly equipped, and what is more important, a properly manned laboratory is the invariable rule. But to the mind of the average non-technical director, the advantage, not to say the necessity of a testing and research department, is a closed book. Possibly he would raise no objection to a department of this character as a means of keeping the assistants out of mischief, and as a spare time job, but he looks upon the whole-time laboratory man, especially at a remuneration that will command the services of a properly trained chemist, as a sort of encumbrance and superfluous expense. Many of our far-seeing scientists and statesmen are deploring the general paucity of technical scientific knowledge throughout the country, but when adequate encouragement and remuneration for ability of this character is forthcoming, the supply will not be wanting.

These remarks are suggested by a perusal of an informative paper on the action of salty coals on refractory materials, read a few days ago by Professor John W. Cobb of Leeds University, before a gathering of the Coke Oven Manager's Association, which is a great assistance towards explaining the cases of unusually rapid corrosion in ordinary gas works' retorts, settings, and furnaces that occasionally perplex gas engineers, and in the absence of other explanation are not infrequently laid to the discredit of the responsible man in charge, as being due to excessive or badly regulated heats. Sodium chloride melts at 800° C, but volatilizes in quantity at lower temperatures. It would therefore appear, that when a coal containing anything more than a mere trace of that salt is charged into a fireclay retort, the greater part is volatilized before the charge has reached the temperature of the containing vessel. The salt vapor is the cause of trouble, as it penetrates the surface of fireclay, and enters into chemical combination, forming a compound of soda, alumina and silica that is fusible at a lower temperature than the original material. The front portion of a retort or furnace would be especially liable to such action. Sodium chloride is very intimately mixed with coal, to such an extent that it cannot be extracted by repeated or long continued washing with water, which suggests that it may be held in chemical combination with other incombustible matter. In such case it may be possible for some of the salt to be retained by the coke; but unless the coke is fired cold, it would not have much chance of injuring the walls of the furnace, as if the salt comes into contact with fireclay at a temperature of 1,200° C. a glaze is formed on the surface, which to a great extent prevents penetration and further corrosion. Other causes of corrosion are the deposition of carbon, and the volatilization of iron in the form of ferric chloride, which in the absence of oxygen may be reduced to ferrous chloride. All of which goes to show the importance of as fine, smooth and close-grained a surface on the interior of the retort or furnace as may be possible, and also the advantage of giving the exposed surfaces a wash of stiff fireclay or silicious cement grouting before exposure to practical working.

A paper read by Mr. E. W. L. Nicol, Engineer and Fuel Expert to the London Coke Committee, at a meeting of the London and Southern District Junior Gas Association, on the subject of "Coke for Steam boilers," forcibly illustrates the fact that the sale of residual products must no longer be left to take of itself, or more accurately, to the tender mercies of buyers; that the excellent work carried out under the auspices of the Sulphate of Ammonia Committee, in connection with the price of sulphate of ammonia, must be extended to coke and tar; and incidentally, that the London Coke Committee appear to be thoroughly competent to take care of coke. The primitive idea of getting rid of tar and ammoniacal liquor was to run them into the nearest ditch, and the next advance was to dispose of the liquids at a take-it-away price. Many gas undertakings have not proceeded far beyond this second stage, so far as coke and tar are concerned, probably because the need for doing so was not immediately evident. But under the stimulus of a bad market, competition, or high prices for materials, one naturally turns to the inherent capabilites of the residuals as a possible means of relieving the situation, and proceed a step further than merely keeping the coke yard clear, or the tar well empty, to inquire whether he is taking his goods to the best market. An examination of the practical remarks put forward by the London Coke Expert furnishes a decided answer as regards coke. The prices received or current for that residual are not commensurate with the calorific value combined with the important advantage of being a smokeless fuel. Much of this is due to ignorance of its properties, even amongst other well informed persons, as instanced by the suggestions of hygienic authorities as to the characteristics of a visionary smokeless fuel that has not yet materialized, and is not likely to do so. In grasping the untangible shadow, they lose sight of the material substance, and are not likely to hit on an article that fills the bill to a greater extent than a good quality dry coke. The paper was illustrated by two scale models of forced draught coke burning apparatus, suitable for boiler furnaces of 27" to 48" in diameter.

Mr. Nicol also had a very practical proposition of a general character to offer, that should not be allowed to pass unheeded. He suggested the formation of a fund to provide the means for experimental research work in connection with the use of coke for all purposes, domestic and technical. A subscription of one shilling per 100 tons of coal carbonized in coke ovens and gas works would form a commencement. The quantity of coal so consumed in Great Britain is about 36,000,000 tons per annum, and a levy of even such a small sum would mean the substantial total of £18,000 yearly.

A bill introduced to the House of Commons in the current session by the Plymouth and Stonehouse Gas Company contains two innovations that are characteristic of the trend of the times. In the first place, power is asked for the purchase of a large tar distilling business that happens to be on the market, and to use the same, not only for their own products, but for working up tar to be purchased from any other gas works situated within the limits of the counties of Devon and Cornwall. There is no novelty in a gas works distilling its own make of tar, and precedent can be quoted for the purchase of tar from small undertakings in the neighborhood, such purchases being an insignificant proportion of the total turnover. But in this instance it would appear that the tar works are appreciably larger than would be necessary if intended to simply serve as an auxilliary to the gas works at Plymouth, and that the gas company contemplated, not only the utilization of their own tar, but also going seriously into the business of tar distilling. This proposal is of such significance to the gas industry at large that the progress of the bill will be watched with great interest; as there can be no doubt that the present merely nominal price of tar, to say nothing of the diffficulty of getting rid of it at any price, which is not an uncommon experience, will stimulate the erection of de-hydrating plants, and other methods of dealing with tar in gas works, especially if the experiments now being conducted on pitch as a gas producing material be attended with any degree of success. Pending the legal decision, the Plymouth Gas Company are carrying on the tar works, in order to assist the requirements of the Minister of Munitions of War. The purchase price of the tar works, as a going concern, is £15,000, and it is thought that a similar sum will be required, in addition, for apparatus and working capital.

The gas company propose to raise this sum by redeemable debentures, which is a second innovation, in respect to which more will be heard in the future. More than 20 years ago I ventured to challenge the wisdom of charging everything that could not be put to revenue account to permanent capital. Certain kinds of outlay,

such as that for appliances on hire, cannot in any sense be called "permanent. They may become displaced and rendered valueless by new improvements at any time. The same applies, to a greater or less extent, to every kind of outlay in manufacturing industry.

The progress of science and discovery seems to be accelerated year by year, and concurrently the "permanency" of capital outlay is a diminishing quantity. The danger of a plant being reduced to "scrap" value by reason of some new development increases, and with it the need for the formation of something in the way of a sinking fund for the replacement of the value of obsolete or antiquated apparatus. In the event of a municipal authority buying a gas undertaking, the invariable practice is to form a sinking fund that will liquidate the purchase price in about 30 years. And a suggestion that a similar scheme, possibly spread over a longer period of time, should be adopted by gas companies is usually met by the objection that the consumer should not be charged with a sinking fund in addition to a dividend. But this is exactly what is done in regard to every business of a temporary or risky character. The only difference is that the percentage rate of profit, reckoned on the annual turnover, is rarely so low as the average dividend paid by a gas undertaking. The individual who formerly owned the business now being taken on by the Plymouth Gas Company would not have been satisfied with a profit of 10% to cover interest, depreciation and redemption on his capital outlay. The company, in accordance with the now general practice, also seek to substitute the calorimetric for the photometric method of testing the gas supply.

The word "redeemable" is sometimes incorrectly applied to "terminable debentures," which are a different thing. The redeemable debenture is liquidated and disappears in the course of time, but the terminable debentures may be renewed at maturity by the issue of new debentures of similar amount. The object in view may be the eventual liquidation of the borrowed sum, but there is also the prospect of being able to raise the money on more favorable terms at a future time. For obvious reasons money is at present unusually dear, and cannot be raised for less than 5½% interest. The issue of permanent debentures on such terms would mean a permanent debt on the undertaking, of that amount. But, perhaps, in seven or ten years time, money will be obtained at 4% and therefore if 10-year debentures are issued, the burden of the high rate of interest will only extend over that period.

Gratuitous Work.

Paper by B. F. NOBLE, to the Southern Gas Association.

We all remember the old-time traveling man who used to come around every season with a pocket full of cigars and plenty of money to buy drinks, suppers, etc. We always liked to see the old fellow, and always smoked his cigars and ate his suppers. We see a few such traveling men now, but for some reason or other they do not seem to be quite as generous as in years gone by. You naturally ask "Why?" To my mind there are two very clear reasons—first, the manufacturers are wiser; second, the public is wiser.

The manufacturers are wiser, because after years and years of experience, they have come to the conclusion that a salesman does not have to throw away lots of money to sell goods. They have found out that selling samples is not selling goods. They have found out that brains and energy, instead of suppers, sell goods. They have found that a salesman does not mind spending the other man's money lavishly, but that the customer does not appreciate gifts as he used to. They have found that by putting this money, formerly thrown away, into their goods, instead of into the salesman's pocket and stomach, the article for sale has better quality to withstand competition. They have found out, also, that the public wants good quality and quick service, for which it is willing to pay.

The public is wiser because it has come to realize that the salesman who gives the best cigars and buys the most drinks does not always have the best goods. It is now ready to admit that in times gone by it bought goods of inferior quality and double quantity because of the salesman with the cigars and the drinks. It knows, too, that a manufacturer who spends money for cigars and drinks has to get the money somewhere, and naturally assumes that the manufacturer either takes the money out of the goods or adds a profit to them to make up for this donation.

Therefore, it has gotten down to this point—the modern manufacturer realized that he has been giving away something of absolutely no use, and for which there was no real reason. The public has been accepting these unnecessary gifts with blinks and smiles and buying goods from the standpoint of quality and service-giving essentials, taking the drinks and cigars just because they were there.

I cite this particular illustration of the manufacturer and the public, because the fundamental principles of selling are similar in all businesses, and it takes two to make a bargain—one to sell, the other to buy.

The gas company in any community represents the manufacturer; so does any retail establishment selling goods. The majority of us are inclined to think, and have been brought up to believe, that selling gas and gas appliances is an entirely different proposition, requiring different sales schemes and arguments than other forms of retail business. We have the impression that because gas is delivered to the customer through a pipe instead of by a delivery wagon in package lots, that it's different. It is not, exeept in the mode of delivery. Do we not buy acetylene gas in tanks for use on our autos? Is not this gas tank our property to do with as we please? Do we grumble with the acetylene people when our headlights stop up from carbon and dirt? No! We do think sometimes, or rather wish, that some wonderful genius could discover some perfect burning substance that does not require attention and is absolutely clean. The acetylene people use the best substance they know of, in fact, the best substance anyone knows of, for their particular purpose. They guarantee a tank full on delivery, but beyond that they do not go. The public accepts this as a just trade, buys the tank, puts the auto line in shape to convey the gas, cleans out the gas burners, if necessary buys new ones, and uses the gas without a mumble, saying it is a fine invention and a convenience without parallel.

Here's the point! The gas company delivers its gas through a service pipe to the meter. Here the service stops. All agreements have been lived up to. The means of conveying this gas to the appliances is a matter to which the customer should attend. It is his gas now, to do with as he pleases. The gas company is doing just what the acetylene people do—making the best gas they know of and using every possible scientific invention to make their product perfect and dependable.

The seller's obligation stops at the point of delivery. Gas companies all over the country are responsible for the public's impression as to where the point of delivery is. The fact that gas companies have never been able to decide the point of delivery, coupled with the belief that their selling scheme had to be different from other retail concerns, led them originally to patch up their service with that clever and far-reaching order, "Gratuitous Work."

There was, once upon a time, a man who got on a jag. At the corner bar, during one of his hilarious moments, he called out that he could beat any man in the city. Nobody took him up. He then called out that he could beat any man in the country. No one accepted. He then called in a very loud voice, "I'll whip any man in the State." At this, a big, strapping fellow stepped up and immediately proceeded to beat the jag up. Afterwards, upon being asked why he let this stranger beat him up so, he replied that "he took in too much territory." So it is with the gas company. Know where to stop.

Before we say more of gratuitous work, let us get these two points clear. We all, I believe, agree that an enterprise selling anything new to the public use, is in a way obliged, to a certain extent, to do some "missionary work" to get their particular article in use. "Missionary work," however, does not mean giving away unnecessarily, but simply means an extra amount of labor and attention for smaller return. It would call "missionary work" legitimate in any business, but gratuitous work never.

The word "gratuitous" in the dictionary, means "giving away something that is unnecessary, without pay or profit, not required by justice, without sufficient cause or reason."

Gas companies have given away millions of dollars through that innocent-looking gratuitous, no-charge order; marked "For the good of the service," by that versatile and none-too-conscientious salesman, who stands up and tells you that the public would use more gas if the companies had a workman at every customers front door every morning to look over the appliances and put them in shape for the day's work.

Let's look over some of our gratuitous work done in the past, and see if we can find a good reason for doing the work for nothing. I will apologize, however, before doing this, to those companies who have not been doing any or all of the below mentioned gratuitous work, and congratulate them for being so far ahead of most of us in this particular thing.

Putting on door springs—Anywhere from 200 to 300 of these orders can easily trickle through the order department of almost any gas company in a year. This means that the gas company has spent in the neighborhood of $1,000 a year for such work. Putting on door springs is not making the service any better. It is simply spoiling the customer by doing for him something that he should have done for himself. Door springs are frail and likely to break with bad use. They break, as a rule, only when they are imposed upon. The person who breaks them should fix them, or pay to have them fixed.

Cleaning ranges and water heaters—I dare say from 200 to 500 orders of this kind can get through a gas company in a year without trouble. By taking a hundred such orders, we find that this costs our company per water heater about $1, and per range about the same. That means that from $500 to $1,000 is spent yearly in this way. In other words, without agreeing to do it when the appliance is sold, we keep it clean and free of dirt indefinitely, thereby further spoiling the customer, since he naturally has been allowed to think that it is the gas company's fault that his appliance is greasy and dirty. It is not the gas company's fault, and the customer does not properly appreciate his appliance when the gas company attends to it gratuitously; but he does appreciate it more when he pays for having this work done, and sees to it that in the future whoever uses the appliance keeps it clean, in order that no expenditure will have to be made.

Connecting and disconnecting ranges and water heaters—In a good many companies, for a long time it has been a rule to make a small charge for this service. In some, however, no charge is made; in fact, I understand some companies are still in the moving business, and are actually moving ranges and water heaters, as well as other appliances, from place to place, at the customer's desire to change. It is hard to estimate how many orders of this kind go through the average gas company; but with 5,000 customers, I would say that close to 3,000 such orders go through every year. This means that from $3,000 to $5,000 spent by the gas company making connections and disconnections.

There are a good many other items of gratuitous work that naturally creep in; in fact, hundreds of them, but these three are the main offenders.

One company I know of, serving about 5,000 consumers, in a population of 50,000, has spent in the past between eight and ten thousand dollars per annum on just such work. Ten thousand dollars is 8% on $125,000. By carefully going over such orders and making small but just charges for all work done by the shop department, this item has been so arranged that a small profit has been made on some of the work. It was doubted that this could be done, so it was decided to take first one form of gratuitous work and then another, to get the public into the habit of paying for all labor and material furnished by the gas company. Almost anything can be done with the public if it is based on justice. The public now has only one comment to make, they pay for work formerly done free, and you hear sometimes "You used to do this free of charge. Why do you charge now?" The answer is, that in the past we had been doing something unnecessary, something for nothing, something no one appreciated, something that was misleading our customers, something in which there was no justice. The customer realizes the justness of the situation, agrees with you as to the reasonableness of the charge, pays the bill and is particularly careful in the future with his appliances because he knows that he has to pay for having them repaired.

Aside from putting the public on a business basis with the gas company, elimination of gratuitous work has had a decided effect upon the salesman and employees of the company. Every man representing the gas company has been only too ready to say to the customer, "Yes, we will attend to this. We will do it without any charge, we will be glad to have this fixed for you, it is a pleasure, etc." Now, the salesman makes practically the same statement, but he always winds up by saying that the cost will be small, we will be glad to attend to it and the charge will be so-and-so.

The public, in its dealings with the gas company, has always wanted service, but now in these modern times, it wants "quick service." It is willing to pay a just charge, but it wants it done now. When we do a thing gratuitously, it is but human to take our time. It is not good business to take our time doing something, it is not good business to slur, it is not good business to do a thing gratuitously. We our scotching our lack of service in all departments by a block of gratuitous work.

Some of you might bring up the argument that the automobile manufacturers are putting up service stations where the customers can take their machines and have them fixed and attended to without any charge. This is true to a certain extent only; you will find upon investigating any service station that only about 10% of the customers take advantage of the service, the other 90% do not. Therefore, we will say that 90% of the cars are not getting the service the stations are designed to give; but if we go into one of the service stations, we will appreciate in a few minutes that this service does not supply us with the new wind-shields or valves or bearings, etc., that it will simply fill the storage batteries with water and give a few suggestions as to how you should run the car.

We still maintain a service department, the cost of which is small to the company, since this particular bureau of information is generally handled by one man, and in connection with other work. He gives service talks, with information as to how the customer can further help the service.

Do not confuse gratuitious work with service. Gratuitous work is really the worst enemy to service the gas companies ever had. The more gratuitous work done, the bigger the expense account and the less money available for service. The more gratuitous done, the more unnecessary complaints from the customers, and the less efficient force to handle them. The more gratuitious work done, the harder to serve the public, and a much harder gas company to run.

Hydrogen for Balloons.

One thousand cubic feet of hydrogen will lift about 70 pounds; the same volume of coal gas about 35 pounds. According to the purity of the hydrogen, its lifting capacity varies.

The ascensional force of gases depends upon their specific gravity, temperature, and the barometric pressure of the atmosphere, and equals the weight of air minus the weight of an equal volume of the gas. Hydrogen permits the employment of smaller ballons, which facilitates transportation and rapid filling, besides affording a smaller target at which the enemy may shoot.

To generate hydrogen gas readily and in sufficient quantities, recourse has been had to various processes. Probably the first method used consisted in employing iron filings and dilute sulphuric acid. In this process the iron filings should be free from rust, and the gas evolved must be clerned by passing through a water seal and lime purifier. The reaction is given by the formula:

$$Fe + H_2SO_4 = FeSO_4 + H_2.$$

Zinc may be used instead of iron, and the gas from zinc is purer than from iron. 100 pounds of sulphuric acid and about 140 pounds of zinc give 1,000 cubic feet of hydrogen, so a balloon with a capacity of 16,000 cubic feet would require about two tons of these materials.

In the Russo-Japanese war, the Russians used a process based on the action of aluminum on sodium hydroxide. This method requires ample water supply, and 5½ kg. of materials for every cubic meter of hydrogen produced. The apparatus consisted of sheet metal containers partly filled with sodium hydroxide. The aluminum chips were held in a gauze drum, a portion of which rests in the liquid. From the producer, the gas passed through a washer and from there to the balloon.

In the Morocco campaign, the Spanish government used a producer developed by Schuckert & Co., using silicon. At temperatures of from 80° to 90° C. its action on sodium hydroxide is energetic. In starting the generator pulverized caustic soda is stirred into a vessel containing water, thus getting a solution 90° C. in temperature. By turning a cock this solution is admitted to the generator vessel, and silicon added. During the formation of the gas, which lasts about 50 minutes, water is again run into the dissolving vessel, and lump caustic soda added, which quickly dissolves with the aid of the hot hydrogen warming the solution vessel. This enables a new cycle to be commenced with only a few

minutes interruption, at the end of every generating process. When the formation of gas is finished, the generator contains a solution of water-glass, a non-injurious liquid, which can be let out without special precaution. The temperature reached does not exceed 110° C. The apparatus is made of iron, and not being subject to chemical or mechanical destruction, is of practically unlimited durability.

The French use ferro-silicon instead of silicon in a producing apparatus called "Silicol." Another method originated by the French is the "Hydrogenit" process, particularly adapted for use where only little water is available. "Hydrogenit" is a mixture of finely powered ferro-silicon and sodium-calcium oxide, which, even in a closed receptacle, burns with a large production of hydrogen. It comes in sheet metal containers, and is said to keep indefinitely at normal temperatures. The containers are placed bodily in the producer and fired. The producer is water jacketed, and towards the end of the process, steam from the jacket is shot into the chamber to accelerate the action. The gas is washed in water and dried by passing through sawdust and coke.

Calcium hydride, a substance known commercially as "Hydrolith" (CaH_2), if dropped into water, evolves hydrogen;

$$CaH_2 + 2H_2O = Ca(OH)_2 + 2H_2$$

The objection to this is its excessive cost. A sodium base may be used instead of calcium, but great care is necessary to prevent ignition of the hydrogen by the heat of the reaction. "Hydrone" is another substance that requires only the addition of water to produce hydrogen.

A German corporation has perfected the old method of producing hydrogen by passing steam over red-hot iron filings. The steam is dissociated, the oxygen combining with the iron to form black oxide (Fe_3O_4), leaving hydrogen free. The iron oxide is regenerated by hot water-gas containing a large percentage of carbon monoxide. The black oxide gives up oxygen and is reduced to spongy iron. The process may be made continuous by using two ovens.

In manufacturing nitrogen and oxygen from the air, low temperatures are employed, but these temperatures are not low enough to effect the separation of hydrogen from water gas. Water gas consists of about 50% of hydrogen, carbon monoxide and some nitrogen, with a small percentage of CO_2 that is eliminated by passing the gas over caustic potash. The gas thus purified is compressed to about 30 atmospheres, and cooled to about the boiling point of oxygen, say 200° C. The liquefiable constituents are the CO and N_2 whose critical temperatures are, respectively, —136° and —146° C. When allowed to escape from an open valve at the temperature of its surroundings, hydrogen, however, does not cool, but rises in temperature. Thus the regenerative method applied in the liquefaction of air is not applicable for cooling water gas. Liquid air is therefore used. In spite of the efforts to eliminate CO_2 and water vapor, traces of these pass into the separating apparatus and are deposited there in solid form, ultimately obstructing it. By having duplicate plants, one can be worked while the other is cleaned by heating and blowing gas through it.

The Signal Corps of the U. S. Army has made experiments with a view to obtaining hydrogen by refrigerating illuminating gas.

A method invented by two Dutch engineers is used both in Germany and in Russia. This process uses gas produced by the fractional distillation of crude oil and tar. The gas is passed through a layer of hot coke, whereby the hydrocarbons break up with ultimate liberation of hydrogen. The product contains from 2 to 3% CO, which is removed by subsequently treating with hot sodium oxide. Oil gas, crude oil, petroleum by-products, tar, benzol, or benzine may be employed in the process, and charcoal can be used instead of coke. The oil, previously heated, is introduced in a spray at the top of the producer. As the oil eventually cools the coke, production is intermittent.

Hydrogen is also a by-product in the electro-chemical manufacture of caustic soda and sodium from sodium chloride.

Hydrogen may be obtained from the electrolysis of water by using lead electrodes and a dilute sulphuric acid electrolyte, or iron electrodes and a 10 to 20% solution of potash. If KOH is used, electrolysis causes the oxygen to combine with the anode, while hydrogen is liberated at the cathode. At intervals the decomposed water has to be renewed, while the potash remains in solution, and there is practically no loss. The electromotive force required is about 3 volts per cell. We installed such a plant at Fort Omaha, Neb., using 30 cells. One thousand five hundred amperes of direct current were passed through the cells in series, the voltage varying from 85 to 120.

In the original electrolytic plants each cell formed an independent unit, and had a positive and a negative connection, and a separate pipe line for hydrogen and for oxygen. The filter press system of Surth came into use about eight years ago, and is used extensively in Germany for military purposes. The apparatus consists of a number of cells that act as the electrodes and the storage tank for the electrolyte. They are of a special metal not attacked by oxygen, alkali or electric current; and pressed together form a hermetically closed tank. The electrodes are connected in series. The separation of the gases formed is effected by a special asbestos tissue placed between the anode and cathode, and separating them from each other. It permits easy passage of the electrolyte, and insulates the electrodes from each other, forming a bipolar electrode; that is, they are positive at one side and negative at the other. Each electrode has in its upper part two canals, so that all the oxygen goes in one canal and all hydrogen in the other. The whole apparatus is filled with electrolytic solution, and the current goes through the apparatus and develops gas on the surface of each electrode. For an apparatus of 180 to 200 cells there is one draw-off for hydrogen and one for oxygen, and one intake for water. Electrodes working four years show no sign of wear.

Hydrogen gas from oil-gas is about 98.4% pure, with a specific gravity of 0.087 to 0.092. From water gas the hydrogen is 97 to 97½% pure; but if this be passed over soda-lime its only impurity is 0.6 to 0.8% of nitrogen. A percentage of 97 to 97½ pure hydrogen corresponds to a density of 0.094, while when the percentage is 99.2 or 99.4, the density falls to 0.077. Schuckert's metallic silicon process gives hydrogen at least 99% pure; the Surth electrolytic process gives gas 99.8% pure.

Stationary plants, usually for generation on a large scale, must be designed along lines more economical than for portable plants. Stationary plants find use at aeronautic establishments, army centers, and where gas is generated to be compressed into cylinders for shipment. The electrolytic plant installed at Fort Omaha had a capacity of 3,000 cubic feet (85 cu. m.) per hour. To follow an army's movements portable plants are mounted on cars or wagons. Some plants can be set up on ship board, some on three or fewer railroad cars, and others on wagons. The capacity of portable plants varies from 9 cubic feet per hour to 56,500 cubic feet.

For transporting in campaign, hydrogen may be absorbed by some chemical substance, capable of restoring it easily and rapidly. Hydrolith and hydrone are in this class. Or, the gas may be compressed in steel tubes. Our service employs cylinders about 7′ long by 5½″ in diameter; and some about 4′ by 8½″, made of cold drawn seamless steel tubing.

The steel cylinders weigh less than the iron and sulphuric acid necessary to produce the hydrogen. The weight of our tubes does not exceed 100 pounds (45 kg.) each. In the French service wagons carrying tubes weigh 3,000 kg. for every 15 kg. of gas transported, about 200 times the weight of the hydrogen. They contain 200 liters of gas at 133 kg. pressure; equivalent to about 25 cu. m. at atmospheric pressure. The German flasks hold about 36 liters of gas at a pressure of 130 atmospheres, which corresponds to about 5 cu. m. of balloon space. In some places compression is 150 to 200 atmospheres (2,200 to 2,940 pounds per square inch) and pressures as low as 700 pounds (47 at.) have been used.

For German conditions it has been found best not to bring the producer to the front, but to send the hydrogen in flasks. The flasks are transported in caissons, 20 to each vehicle, so arranged that six caissons can be coupled together when the balloon is to be filled. The French have wagons that carry six tubes. The transportation of hydrogen in steel tubes is quite old practice, the English have used them since 1882; the Italions since 1887.

The Germans fill a 600 cubic meter balloon from 120 flasks in about 20 minutes. Using oil gas for producing hydrogen requires one to two hours to fire up. According to the size of the plant being used, Schuckert's metalic silicon process allows full production of hydrogen to be reached in from 10 to 45 minutes from the time the command is given. Other processes require different times; so the compressed gas in flasks has a considerable advantage as far as the time factor is concerned. Their two principal objections are the danger of explosion and the dead weight to be carried.

A pipe line of 4½ kilometers for carrying hydrogen is in successful operation in Germany. It can supply 1,000 cubic meters of gas daily. The joints are welded, with unions at long intervals.

The cost of production varies, of course, with the size of the plant, market and labor conditions, and the process used. Some *alleged* costs per cubic meter (35 cubic feet) are: Ferro-silicon, 20 cents; hydrogenit, 32 cents; hydrolith, 100 cents; steam and hot iron filings, 3 cents; distillation of crude oil and tar, 3½ cents; water gas, 25 cents; old method of iron and sulphuric acid, 25

cents; calcium hydride, 175 cents; silicon and caustic soda, 210 cents. By electrolysis, 1,500 amperes will produce 23 cubic feet (0.66 cu. m.) of hydrogen, and 11½ cubic feet (0.33 cu. m.) of oxygen per cell per hour.

The usual fixed balloon has a capacity of 600 cubic meters, and dirigibles up to possibly 60,000 cubic meters. A German dirigible that descended in France in 1913 had a volume of 20,000 cubic meters, and lifting capacity of 20,000 tons. The normal internal pressure is understood to be 2 ounces per square inch. Cotton, silk, goldbeater's skin, and various rubberized fabrics are used as balloon envelopes. Silk is objectionable because of its cost, and its accumulating static electrical charges. Great Britain has used goldbeater's skin. Rubberized fabrics oxidize and crack. The envelope should be strong, elastic, impermeable to gas, water repellant, and of light weight.

Hydrogen is so light that in case of leaks, even low down in the envelope, the gas rises, but if mixed with air in a balloonet, it is heavier, descends, and may be exploded by the engine.

Unless the balloon envelope is elastic, a rise in altitude of 125 feet, or an increase in temperature of the gas of 2½° F. necessitates the loss of gas. Goldheater's skin allows a rise to 2,000 feet without loss of gas. As fuel is used up or explosives dropped, the tendency of the lightened balloon is to rise, thus causing a loss of gas. In dirigibles, there is ordinarily sufficient lifting capacity only when the motors are running. If they stop, the vessel must descend or jettison some ballast.

The hitherto rapidly fluctuating buoyancy of the airship may now be controlled through the use of the graduated motor exhaust, which is distributed by ducts throughout the air-jacket between the outer and inner hulls; and this system makes possible the passing of hot and cold currents through the air-jacket. These hot and cold currents expand and contract the gas, producing rapid ascent or descent. This device assures a static gas, which maintains the airship for long periods at normal buoyancy.

If the air-jacket contains nitrogen gas, it insulates the hydrogen from atmospheric effects, and acts as a preventative of fire. The exhaust of the motor has been discharged into a balloon containing hydrogen, without setting it afire. Experiments with the nitrogen jacket explains the story about the Germans using non-inflammable gas.—*From paper by Capt. E. D. Arderg.*

Recent Patent Issues.

Prepared for the American Gas Light Journal by Royal E. Burnham, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,165,578. Registering and Recording Device for Meters and the Like. I. S. Dement, Chicago, Ills.

1,165,587. Gas Cooking Stove. J. Fritschi, Ofringen, Switzerland, assignor to Ida Kappeler, Zofingen, Switzerland.

1,165,657. Gas Apparatus. O. B. Evans, Landsdowns, Pa., assignor to United Gas Improvement Co., Philadelphia, Pa.

1,165,715. Means of Controlling the Quantity and Quality of the Production of Gas. J. M. Rusby, Philadelphia, Pa., assignor to the United Gas Improvement Co., same place.

1,165,835. Gas Burner. E. Birkholz, Chicago, Ills., assignor to the Birkholz Co., same place.

1,166,091. Lamp and Light. A. E. Shaw, Philadelphia, Pa., assignor to Pennsylvania Globe Gas Light Co., same place.

1,166,183. Method of Making Gas. H. A. Carpenter, Sewickley, Pa., assignor to Riter-Conley Mfg. Co., Pittsburgh, Pa.

1,166,184. Valve Mechanism for Gas Retorts. H. A. Carpenter, Seweckley, Pa., assignor to Riter-Conley Mfg. Co., Pittsburgh, Pa.

1,166,422. Apparatus for the Manufacture of Coke. J. Armstrong, London, England.

1,167,021. Apparatus for Producing Gaseous Fuel. F. M. Rites, Ithaca and Slaterville Springs, N. Y., by C. H. Gallagher, executor, Ithaca, N. Y., assignor to P. C. Rites, guardian of Marian B. Rites.

1,169,149–50. Method of Treating Coal Gas. H. A. Carpenter, Sewickley, Pa., assignor to Riter Conley Mfg. Co., Pittsburgh, Pa.

1,167,397. Automatic Cut-Off for Gas Burners. P. Getson, Philadelphia, Pa.

1,167,446. Burner. W. K. Twomey, Chicago, Ills.

1,167,565. Pipe Laying Machine. Jackson, Broken Arrow, Okla.

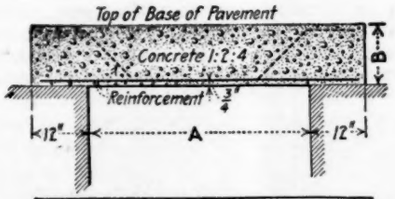
1,167,909. Gas Washer. T. McDonald, Youngstown, O.

1,168,055. Gas Generating Apparatus. R. B. Brown, Milwaukee, Wis., assignor te Riter Conley Mfg. Co., Pittsburgh, Pa.

New Methods and Appliances.

Regulation of Street Excavations in Houston, Tex.—The provisions of the city ordinance regulating excavations in public streets in Houston, Tex., seem rather drastic; but the city has recently spent nearly $3,000,000 in new pavements, and intends to protect them.

For instance; any person, firm or corporation desiring to make a cut in a street must file a written application for a permit, containing a detailed description of what is to be done and, in most cases accompanied by a plan showing the location. The applicant must deposit, in cash or certified check, double the estimated cost of the work.



A	B	Reinforcement	Note
2'	10½"	½"ø Tw. Bars, 8" C. to C.	Alternate Bars bent up
3'	12"	½"ø " " 7" "	
4'	13"	½"ø " " 6½" "	
5'	14"	½"ø " " 9" "	
6'	15"	½"ø " " 8½" "	

Reinforced Concrete Slab Used Over Backfilled Trenches.

In streets graveled, macadamized or paved the trenches may be refilled with moist, damp earth or by means of water-tamping, as the city engineer may direct. When water-tamping is used, the water is turned into the trench after the first 12" of backfill has been placed; and the trench is kept flooded until all the backfill is put in. When the surface is reached, the materials are allowed to settle, the trench is flooded again, refilled to the surface and again allowed to settle; and then filled slightly above the level of the street. All longitudinal trenches more than 100 feet in length must be rolled with a steam roller weighing not less than 6 tons.

On streets macadamized, graveled or shelled, the surfacing material most be first removed and kept separate from other materials. The trench is backfilled, as provided for in unpaved streets, but the backfilling must end 3" below the surface of the street. The macadam, gravel or other material is then replaced and thoroughly tamped and rolled, and left 2" above the street surface and then rolled.

If the street is paved with brick, wood block, asphalt, or other pavement requiring a substantial foundation, the trench must be refilled with well-rammed gravel, broken stone or brick-bats, concrete or other material that, in the opinion of the city engineer, can be so placed that there will be no settlement; or the trench may be refilled with earth in the same manner as described for unpaved streets, and then covered with a reinforced concrete slab (see cut). If thought desirable, the city may do this part of the work and deduct the cost from the deposit on file with the city treasurer.

Another section of the ordinance makes it the duty of every person, firm or corporation having pipes, conduits, ducts or tunnels under any public highway to file with the city a set of maps on a scale of 200 feet = 1 inch, on tracing cloth, 15" x 23", showing in detail the exact location, size, description, date of installation (if known) of all mains, laterals and service pipes, and of all valves, pressure regulators, drips, manholes, handholes, transformer chambers or other appliances. It is also their duty to file within 15 days after the first of January each year, a corrected set of maps, showing the complete installation of all such pipes and appliances, including all installations of the previous year. Whenever any pipe, conduit etc., is abandoned, the city engineer must be notified in writing, and the abandoned line designated on the maps for that year.

Items of Interest from Various Localities.

OVER 200 employees of the Boston Consolidated Gas Company representing every department of the company, attended an invitation party given by the Home Lamp Department, on April 26th, at Fisher Hall, Roxbury, Mass. The entertainment opened at 8 o'clock with the following programme: Mr. Roger Hunt, Vocal Selection; Messrs. Larkin Bros., Buck and Wing Dancing; Mrs. C. D. Wood, Vocal Selection; Master Orrin Emerson, Violin Solo; Master Leonard Shank, Boy Comedian; Miss Dorothy Sherer, Vocal Selection; Mr. Ralph Davidson, Banjo Selection; Miss Bertha Field, Irish Step-Dancing; Mr. Eugene O'Neill, Vocal Selection; Mr. Frank Cook, Italian Monologue; Messrs. F. Josselyn and B. Webber, Musical Selection; Master Leonard and Miss Marie Shank, Japanese Sketch. An address of welcome was delivered by Mr. C. J. Connell of the Home Lamp Department, and at the close of the entertainment an intermission was declared for refreshments. Dancing followed, continued until 1 o'clock. The Committee on Arrangements consisted of the following from the Home Lamp Department: Messrs. Sharpe, Hall, Caie, Webber, Letters, Callahan and J. Sullivan.

THE "London Journal" says: "Bow Common Lane, London, was the scene of an extraordinary incident on the evening of the 20th ult. A large body of workmen from a neighboring gas works assembled bearing an effigy, on the breast of which was inscribed a large cross, and on the head 'The Tyrant of Bow Common Slaughter-House,' to which a light was applied, amidst the yells and shoutings of the spectators. This unprecedented act is ascribed to the alleged tyrannical and overbearing conduct of a gas manager to the workmen under him, and has been commemorated by a printed card, extensively distributed among the persons employed in the Metropolitan gas works. The vicinity of the works has since been placarded with handbills, purporting to be signed by upwards of a hundred of the workmen employed in that establishment, denying all connection with the outrage committed, which they allege was the act of three or four discharged workmen. In another handbill, subsequently circulated, it is asserted that some of the signatures were obtained under the threat of dismissal."

CONTRACTS for the new works equipment at Waterville, Me., for the Kennebec Gas and Fuel Company, have all been placed. The Improved Equipment Company will install a bunch of 6's, and the Western Gas Construction Company will furnish the boosters, exhausters and condensing units. Engineer W. H. Fritchman reports the buildings under way.

THE Gas Production Committee will have charge of the June meeting of the Empire State Gas and Electric Association, which will be held at Coney Island on June 9th.

THE Institute Committee on Consumers Meters in preparing its report has found several companies using unique ways of setting meters; and as they consider some of them of more than passing interest, the committee plans to install an exhibit at the annual convention at Chicago, in October. Companies using anything in the way of a "wrinkle," or having a system of setting differing from ordinary practice, are urged to write Mr. W. K. Harrington, chairman Committee on Consumers Meters, 47th street and 11th avenue, New York, and arrange to exhibit their devices.

THE Brown Hoisting Machinery Co. announces the appointment of its Vice-President, Mr. Alexander C. Brown, to the position of General Manager, succeeding Mr. Richard B. Sheridan.

THE Southern Gas Association will publish a monthly bulletin, edited by A. H. Rumbold of the Tampa (Fla.) Gas Company. The initial issue is to appear next month.

CARRYING out the modern corporation policy of publicity, the Peoples Gas Light and Coke Company of Chicago has inaugurated a new advertising campaign. In a series of newspaper articles the company will take the public into its confidence and discuss ways of lowering gas bills. In the initial article it declares it has no secrets to withhold from the public, and expresses a willingness to tell all the details of its business, service, problems and plans. The articles recognize two salient points—the power of public opinion in business, and the force of public understanding in shaping this opinion. The company maintains that the only way to reduce the cost of manufacturing gas in Chicago is to "adopt scientific heat unit gas in place of obsolete candle power gas," and that the company is powerless to make this change without the consent of the authorities.

PERMISSION has been granted by the County Commissioners to the Savannah (Ga.) Gas Company to extend its gas mains from Gwinnett and Ott streets into Chatham county, in order to supply patrons in the suburbs.

ROSCO NETTLES, manager of the Lakeland (Fla.) Gas Company, has become the owner of the Sparling property, just across the street from the property bought by the Government for the post office. It is announced that the gas company will erect a brick block on the plot.

MR. AND MRS. THOMAS DAVID MILLER announce the marriage of their daughter, Helen Hart Miller, to Mr. Guy Kirksey, on Saturday, April 29th, 1916, at St. Louis.

SALES by the United Gas Improvement Company, in Philadelphia, for the three months ended March 31, 1916, and for the previous quarters, compare as follows (in cubic feet):

	1916.	1915.
3 months ending March 31....	2,758,401,000	2,561,952,210
3 months ending June 30.....	....	2,256,216,540
3 months ending Sept. 30.....	.....	2,240,856,440
3 months ending Dec. 31.....	.....	2,683,127,180
Total year.....	.....	9,742,152,370

The money collected for the March quarter, including some sales in previous quarters, was $2,725,308, received in payments for 2,725,308,100 cubic feet, of which 27,000 cubic feet were sold prior to January 1, 1908, and 162,390 cubic feet sold between January 1, 1908, and January 1, 1913, and 2,725,118,510 subsequently. The amount of money due to the city, under the terms of the gas works lease, is $545,050, being 10 cents on 162,390 cubic feet, and 20 cents on 2,725,118,510 cubic feet.

AT a recent meeting of the employees of the Lynn (Mass.) Gas and Electric Company, for the purpose of forming a permanent society with the object of establishing closer relations and good feeling between the employees and the company, an excellent supper was provided by the company. At 8 o'clock the meeting was called to order by Temporary Chairman Benjamin S. Courtis. A code of by-laws, prepared by a committee previously appointed, was presented and accepted, after which a permanent organization was perfected as follows: President, Benjamin S. Courtis; secretary, Harry Whitman. Committees were appointed, one from each of the five sections, to form a permanent committee of two from each section to serve as an executive board of the society.

A NEW method of using garbage to produce gas is outlined in a communication received by City Attorney Williams of Milwaukee, Wis. The method is offered by the American Gas and Incinerator Company, which claims to be able to produce gas from the garbage by the use of certain chemicals, and to obtain by-product of tar and coke. Milwaukee now burns its garbage, obtaining no revenue from it. Mayor Hoan is looking into the question of garbage disposal with a view of suggesting a method by which a revenue may be obtained.

A LOCAL paper says that improvements in the equipment of the West Davenport, Ia., plant of the People's Light Company will begin at once, according to announcement from the general manager, H. C. Blackwell. One of the largest improvements will be a $25,000 "booster" station, which will give the city uniform gas pressure. Other mechanical improvements, including stoking devices, will be installed. The company will spend over $100,000 this year in plant improvements in equipment, new mains, etc.

THE second annual banquet of the Pittsfield (Mass.) Coal Gas Company bowling league was a most enjoyable affair. More than 25 were present, and at the conclusion of the meal, the guests all felt as if they had scored a 10 strike. One of the features of the evening was a bowling match between Patrick Lynch and Edward Flynn, and John Walsh and George L. Nixon, the latter pair winning by a margin of 60 pins. The bowling season for this year was the most successful ever held by the league, as five teams bowled all through the season of eight weeks, and some close competition resulted. Those present at the banquet were John Griffin, Edward Roel, Robert Collins, Rudolph Kilian, Joseph Duquette, Herman Meyer, George Nixon, William Gleiner, John Quinn, Walter Briggs, Hector Teot, Patrick Lynch, Edward Flynn, Frederick Connor, Daniel Haggerty, A. E. Adams, John Finn, John Walsh, Noel Daniels, William Duffy, Horace Trego and Samuel Bilotta.

THE Executive Committee of the Board of Directors of the Pacific Gas and Electric Company, desiring to recognize in a substantial way the long service of employees, has determined to put into effect a plan of pensions. The plan provides for "any officer or employee who attains the age of 65 years, after 15 years of service." "Any employee, after 20 years of service, who may become unfit by reason of physical or mental disability:" "Any employee, after 20 years of service, who becomes incapable of continuing his service by reason of injuries received at work in the employment of the company, will be retired and pensioned." The allowance authorized are upon the following basis: For each year of service an allowance of 1½% of the average regular monthly pay received for the last 10 years preceeding retirement. Thus, if an employee has been in the service for 40 years, and his average salary, or wages, for the last 10 years was $85 per month, his pension allowance would be 60% of $85, or $51 per month. Provided however, that in no case shall the pension allowance for an employee whose entire time has been given to the company be a less amount than $15 a month.

THE Doherty interests are said to be behind the proposed consolidation of five natural gas companies in Western New York, and will build a coke oven plant near Buffalo to augment their supply. Petitions are now before the State Commission as follows:

Joint petition of South Shore Natural Gas and Fuel Company and the Frost Gas Company for consent to the transfer of the franchise and system of the former to the Frost Gas Company.

Joint petition of South Shore Natural Gas and Fuel Company and Principal Realty Company for consent to the transfer by the South Shore company of its natural gas wells and leases to the Principal Realty Company.

Joint petition of Silver Creek Gas and Improvement Company and Principal Realty Company for consent to the transfer by the former of its natural gas wells and leases to the Principal Realty Company.

Joint petition of Fredonia Natural Gas Light Company and the Frost Gas Company for consent to the transfer of the franchise and system of the former to the Frost Gas Company.

Joint petition of Silver Creek Gas and Improvement Company and the Frost Gas Company for consent to the transfer of franchise and system of former to latter company.

Utilities Commission News.

NEW YORK WATER POWER DEVELOPMENT.—The up-State Public Service Commission has made an order providing for the financing of the $2,000,000 hydro-electrical development on the Seneca outlet at Seneca Falls, through the Seneca Power Corporation, the Central New York Gas and Electric Company and the Empire Coke Company, made possible by the settlement in the Court of Claims, of the water power rights of a large number of mill owners in Seneca Falls, who pooled their interests and are now turning the new development made necessary by the barge canal over to the Seneca Power Corporation. Twenty million kilowatts a year will be made eventually available through this enterprise.

The Seneca Power Corporation will increase its stock from $5,000 to $1,250,000, which it is now authorized to sell at not less than par. The proceeds will be paid to H. R. Micks and P. H. Kendig, a committee of the Seneca Falls Power owners, for all the available rights, set aside by the Court of Claims decision, from the water not necessary for the operation of the barge canal, and $53,000 of the proceeds, plus $185,000 of the proceeds of an issue of $450,000 6% bonds, also authorized for the Seneca Power Corporation, will be be paid to the Seneca Falls Woolen Company and the Ivory Button Company for their rights.

In its order, however, the Commission expressly states that the issue of securities for payment of these water rights will not preclude the Commission from investigating the value of the rights and assigning them a different value in any case that may hereafter arise in connection with the rates charged for power.

The balance of the proceeds of the issue of Seneca Power bonds, which must be sold at not less than 94, will be used toward paying $290,000 for the erection of the company's plant and for expenses of litigation in the Court of Claims and other organization expenses, including mortgage and internal revenue taxes.

The Commission also authorizes the the Central New York Gas and Electric Company to lease and operate the Seneca power plant. The Central New York Company will acquire $150,000 of the Seneca Power stock, which it is authorized to pass on to the Empire Coke Company, both transfers at par. The Empire Coke Company is authorized to issue $150,000 of its 6% collateral trust bonds at 93, netting $139,500, to go towards the purchase of this stock.

The Central New York Company guarantees the principal and interest of the Seneca Power bonds, and the Empire Coke Company, in turn, guarantees the payment of the Central New York's rental to the Seneca Power Corporation.

The ultimate electrical development planned for this enterprise is 20,000,000 kilowatts a year. The Central New York Gas and Electric Company, with demands on its present power that it can meet neither through its own stations or through purchase of Niagara power, has contracted to purchase the entire output at ¾ cents per kilowatt hour. This power will be distributed throughout the Central New York's territory along the Auburn Road, and as far west as Ilion.

MR. AITCHISON LEAVES OREGON COMMISSION.—Clyde B. Aitchison, chairman of the Public Service Commission of Oregon, has accepted the position of solicitor for the National Association of Railway Commissioners, in connection with the pending appraisal of the railroad, telegraph and telephone systems of the United States being made by the Interstate Commerce Commission. Mr. Aitchison's headquarters will be at Washington. The position tendered Mr. Aitchison is a new one, his function being to represent the interests of the States and State Commissions at Washington during the federal appraisal. The carriers have a strong organization for the protection of their interests, and it was the unanimous view of the State Commissioners at the annual convention in San Francisco last fall that representation by the states was necessary in the public interest; and members of the Interstate Commerce Commission strongly urged the importance of the state commissions taking some such action. Up to the present, the only appearance before the Interstate Commerce Commission in opposition to the claims of the carriers has been by volunteers and committees from the state commissions.

CONNECTICUT COMMISSION ORDERS MAIN EXTENSION.—After hearing the petition of residents of Maple Hill in the town of Newington, alleging failure or refusal of the New Britain Gas Light Co. to extend its mains and furnish service, the Connecticut Public Utilities Commission held that a utility is presumed to anticipate the obligation to make reasonable extensions that may not be immediately profitable in entering territory by securing a charter right. A utility may be required to make an extension that will not be immediately profitable if the prospects of future business are reasonably good. As a protection in part against loss in the early years of extension that yield an income small in proportion to the cost of the installation, a utility is justified in exacting a moderate annual minimum charge. Although the expense will be out of proportion to the immediate return, the company was required to extend its mains into territory where it had secured charter rights to serve, where the extension will ultimately be profitable and the exaction of a minimum charge will reduce the losses incurred during the early period of operation.

Financial Notes.

THE SCHENECTADY ILLUMINATING COMPANY has been authorized by the up-State New York Public Service Commission to issue $886,000 of its common stock, and the Mohawk Gas Company of Schenectady has been authorized to issue $870,000 of its stock for the refunding of notes and other indebtednesses of the two companies. Both issues must be sold at not less than par, and both authorizations are accompanied by provisions compelling the companies to bring their accounts into accord with the Commission's uniform systems. In the case of the Schenectady Illuminating Co. the Commission has approved the company's plan for amortizing at $50,000 a year one-half of the sum of $1,462,113.43, now carried as a balance in a capital account; and other minor changes are required in the company's accounting. Of the proceeds of the present issue of stock, $270,000 will be applied to the payment of the balance of notes standing since 1912, $295,000 will be paid for the discharge of accounts and interest, and $320,000 will be paid into the treasury of the company to reimburse it for money expended for capital assets. $507,000 of the Mohawk Gas Company's proceeds of the stock sale will be used for the payment of notes and accounts, and $362,000 for the reimbursement of the treasury for capital purposes.

THE COMMONWEALTH POWER AND LIGHT COMPANY, Jackson, Mich., reports that $9,435,600, or 27.75% of the tatal outstanding preferred and common stock is held in the States in which the company's properties are situated. The combined result of operations for 1915 is shown in the following statement, which eliminates all sales of electric energy to subsidiary distribution and railway companies and other inter-company transactions:

Gross receipts:	1915.	1914.
Gas	$2,670,456	$2,604,889
Electric, heating and water	5,650,816	5,130,897
Railway	6,268,851	6,270,698
Total	$14,590,123	$14,006,484
Operating expenses	6,964,679	6,761,891
Gross income	$7,625,444	$7,244,593
Fixed charges, including taxes and dividends on outstanding preferred stocks of subsidiary companies	5,329,857	5,000,859
Net income available for dividends, replacements and depreciation	$2,295,587	$2,243,734
Dividends on preferred stock	960,000	960,000
Balance	$1,335,587	$1,283,734

THE comparative statement of earnings of the CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER COMPANY for the quarter ended with March, is as follows;

	3 months ending March 31, 1916.	March 31 1915.
Gross income	$1,955,758.95	$1,740,517.55
Operating expenses and taxes	1,000,867.43	936,563.11
Net earnings	$954,861,52	$803,954.44
Fixed charges	381,810.55	413,804.62
Net income	$573,050.97	$390,149.82

The earning record is excellent when it is remembered that the new low rates for gas were in effect during the quarter. In the three months there was marked increase in gas consumption, new high records being reached on certain days in February.

WHILE the refusal of the Railroad Commission of California to approve the proposed 3% dividend in common stock on the common stock of PACIFIC GAS AND ELECTRIC COMPANY was not unexpected, the remarks of the Commission, in announcing the decision, had not been anticipated. The action of the Commission in criticizing the depreciation reserve policy of the company, was not in line with its opinion in 1915, when it approved a stock dividend of 6%. The criticism of the Board has weakened the market position of the stocks materially, despite the fact that the board of directors had just placed the common on a 5% cash dividend basis. Men in close touch with the affairs of the company say the criticism by the Commission was unwarranted, and point to the fact that the company is now, in addition to the regular charges for maintenance, amounting to almost $80,000 a month, charging against income $125,000 a month for depreciation reserve. In addition that the company has an accumulated depreciation reserve of $2,772,848, and out of $3,222,319 expended in 1915 for additions and betterments to the properties of the company, $1,079,014 was charged against earnings and but $2,143,305 to capital The company stockholders need have no fear of the ability of the company to continue the 5% rate just instituted on the common stock. In 1915 it earned almost 9.5% on its common, and in 1916 earnings have been running at the rate of close to 12% a year on the junior issue. After providing for the full 5% dividend in 1916 on the common stock, there would be approximately $1,500,000 remaining from its cash balance at the close of 1915. To be added to this will be all the cash earned from operations of 1916. Under these circumstances it is felt that a complete showing of the company's financial and physical condition will lead to a more friendly attitude on the part of the commission.

THE Public Utilities Commission of Ohio has authorized the issuance of $4,500,000 first and refunding mortgage 5% sinking fund gold bonds of the CINCINNATI GAS & ELECTRIC COMPANY. A syndicate has been formed with A. B. Leach & Co. as managers, and public offerings of the bonds will be made at 99½ and interest.

Current Prices of Public Utility Securities.

	Bid.	Asked.
American Gas Co	120	122
*American Gas & Electric	147	150
*American Gas & Electric pf	50	52
American Light & Traction	373	378
American Light & Traction pf	111	113½
American Power & Light	64	66
American Power & Light pf	85	86½
American Public Utilities	45	47
American Public Utilities pf	76	79
Associated Gas & Electric pf	55	65
Atlantic P. & L. pf	92½	95
Brooklyn Union Gas Co		
Cities Service	186	188
Cities Service pf	84	85
Colorada Power	25½	26½
Colorado Power pf	100	101½
*Commonwealth Pr., Ry. & Lt	64	65
*Commonwealth Pr., Ry. & Lt. pf	84	86
Consolidated Gas Co	134	...
Denver Gas & Electric gen. 5s	97	99
Electric Bond Deposit pf	78	82
Electric Bond & Share pf	100	103
Federal Light & Traction	12	14
Federal Light & Traction pf	46	49
Gas & Electric Securities	175	195
Gas & Electric Securities pf	90	95
Northern States Power	60½	61½
Northern States Power pf	96½	97½
Pacific Gas & Electric	59¼	60
Pacific Gas & Electric, original	91	94
Pacific Gas & Electric 1st pf	91	93
Republic Ry. & Light Co	27	29
Republic Ry. & Light Co. pf	72	75
Southern California Edison	88½	90½
Southern California Edison pf	103	105
*Standard Gas & Electric	12	12½
*Standard Gas & Electric pf	37	37½
Tennessee Ry., Light & Power	12	12½
Tennessee Ry., Light & Power pf	51	53
Toledo Trac., Light & Power	32	35
Toledo Trac., Light & Power pf	63	66
*United Gas Improvement Co	88	...
United Light & Railways	53½	55
United Light & Railways 1st pf	77	78
Western Power	16	17
Western Power pf	60½	61½

*Par value $50